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# POLLUTION OF THE INTERSTATE WATERS OF THE MONONGAHELA RIVER AND ITS TRIBUTARIES - PENNSYLVANIA, WEST VIRGINIA, AND MARYLAND. PROCEEDINGS OF CONFERENCE, SECOND SESSION, HELD AT PITTSBURGH, PENNSYLVANIA ON AUGUST 24, 1971

Environmental Protection Agency
Washington, D. C.

24 August 1971

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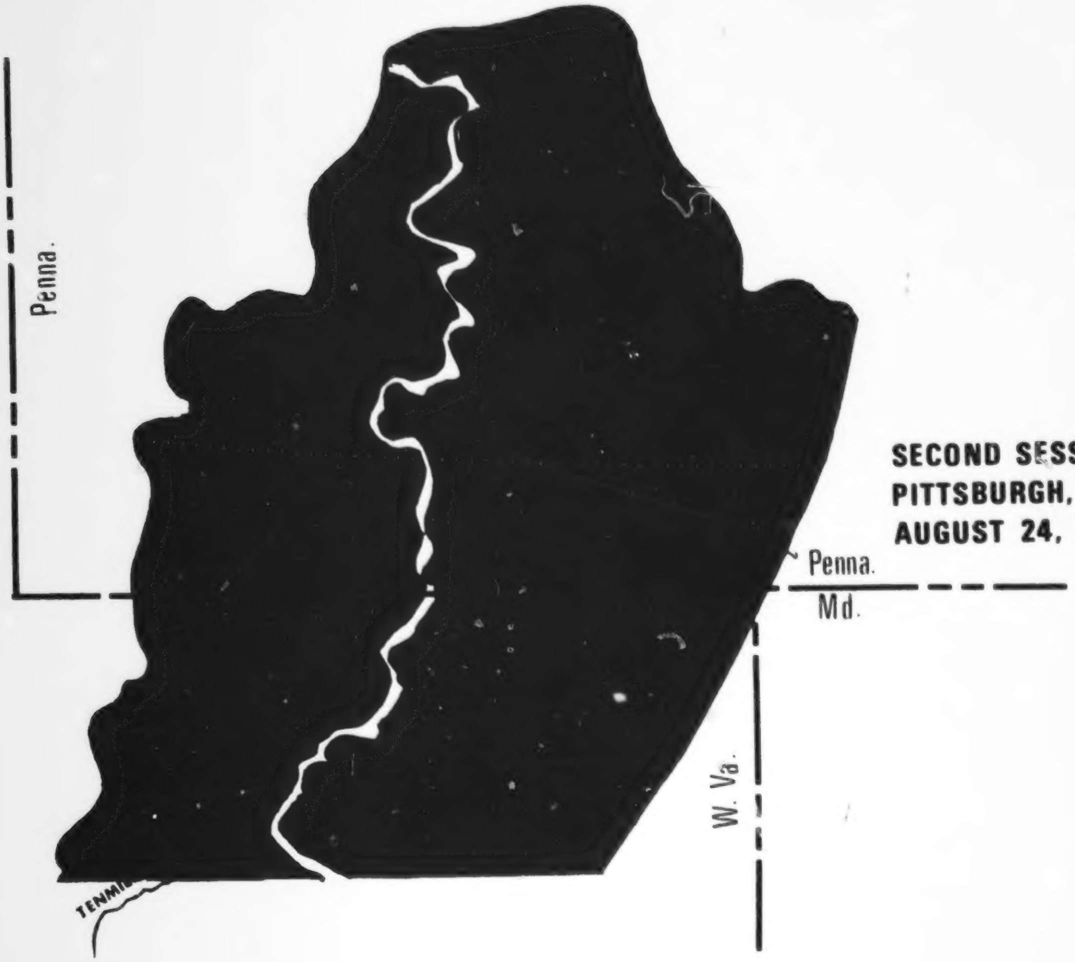
# PROCEEDINGS



SECOND SESSION
PITTSBURGH, PENNSYLVANIA
AUGUST 24, 1971

# CONFERENCE

## In the Matter of Pollution of the Interstate Waters of the Monongahela River and its Tributaries - Pennsylvania, West Virginia, Maryland.

ENVIRONMENTAL PROTECTION AGENCY

# SECOND SESSION OF THE CONFERENCE
# IN THE MATTER OF POLLUTION OF THE INTERSTATE WATERS OF THE MONONGAHELA RIVER AND ITS TRIBUTARIES

(PENNSYLVANIA, WEST VIRGINIA, AND MARYLAND.)

King's Garden Room
Pittsburgh Hilton Hotel
Pittsburgh, Pennsylvania
August 24, 1971

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Second Session of the Conference in the Matter of Pollution of the Interstate Waters of the Monongahela River and Its Tributaries (Pennsylvania, West Virginia and Maryland), held in the King's Garden Room of the Pittsburgh Hilton Hotel, Pittsburgh, Pennsylvania, on Wednesday, August 24, 1971, at 9:30 a.m.

- - -

PRESIDING:

Murray Stein, Chief Enforcement Officer - Water, Environmental Protection Agency, Washington, D.C.

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# PROCEEDINGS

## OPENING STATEMENT

## BY

## MURRAY STEIN

MR. STEIN: The conference is open.

This second session for the conference in the matter of pollution of the interstate waters of the Monongahela River in the States of West Virginia, Maryland, and Pennsylvania has been called under the provisions of section 10 of the Federal Water Pollution Control Act.

The first session of this conference was held on December 17-18, 1963.

Both the State and Federal Governments have responsibilities in dealing with water pollution control problems. The Federal Water Pollution Control Act declares that the States have primary rights and responsibilities for taking action to abate and control pollution. Consistent with this, we are charged by law to encourage the States in these activities.

At the same time, the Administrator of the Environmental Protection Agency is charged by law with specific responsibilities in the field of water pollution control in connection with pollution of interstate and navigable waters. The Federal Water Pollution Control Act provides that pollution of interstate or navigable waters which endangers the health or welfare of any persons shall be subject to abatement. This applies whether the matter causing or contributing to the pollution is discharged directly into such waters or reaches such waters after discharge into a tributary.

The purpose of this conference is to bring together the State water pollution control agencies, the interstate agency, representatives of the Environmental Protection Agency, and other interested parties to give careful consideration to the acid mine drainage problem and other pollution problems remaining on the Monongahela in order that a meaningful program of remedial actions can be scheduled.

At the December 17-18, 1963, conference session, the conferees recommended the establishment of a technical committee consisting of representatives of West Virginia, Pennsylvania, Maryland, the Ohio River Valley Sanitation Commission, and the Federal Government to explore the means of abating pollution caused by coal mine drainage. A considerable amount of effort was expended to locate, sample, and describe the sources of mine drainage especially during the period January 1965 through May 1968. Since then, this information has been studied, analyzed, and reduced to report form.

The conference today will consider these proposals of the conferees for remedial action as well as other matters considered pertinent by the conferees.

The parties to this conference are the official State water pollution control agencies of West Virginia, Maryland, and Pennsylvania, the Ohio River Valley Sanitation Commission, and the Environmental Protection Agency.

The West Virginia Department of Natural Resources will be represented by Mr. Edgar Henry. The Pennsylvania Department of Environmental Resources has designated as its conferee Mr. Walter Lyon. The Maryland Department of Natural Resources will be represented by Mr. Paul McKee. The representative of the Maryland Department of Health and Mental Hygiene is Howard Chaney. And representing the Ohio River Valley Water Sanitation Commission is Robert Horton. The Federal conferee is Mr. Grover Cook of our Charlottesville Regional Office. My name is Murray Stein, and I am the Chief Enforcement Officer - Water, Environmental Protection Agency in Washington, D.C. and the representative of Administrator Ruckelshaus.

Opening Statement - Murray Stein

Participation in this conference will be open to representatives and invitees of these agencies and such persons as inform me they wish to make statements. However, only the representatives of the State water pollution control agencies, the interstate agency, and the Environmental Protection Agency constitute the conferees.

Now, a word about the procedures governing the conduct of the conference. The conferees will be called upon to make statements. The conferees, in addition, may call upon participants whom they have invited to the conference to make statements. In addition, we shall call on other interested individuals who wish to present statements. At the conclusion of each statement, the conferees will be given an opportunity to comment or ask questions, and I may ask a question or two. This procedure has proven effective in the past in reaching equitable solutions.

At the end of all of the statements, we shall have a discussion among the conferees and try to arrive at a basis of agreement on the facts of the situation. Then we shall attempt to summarize the conference orally, giving the conferees the right to amend or modify the summary, and we will attempt to read or announce this summary orally at the conclusion of the conference.

Under the Federal law, the Administrator of the

Opening Statement - Murray Stein

Environmental Protection Agency is required at the conclusion of the conference to prepare a summary of it which will be sent to the conferees. The summary, according to law, must include the following points:

1. Occurrence of pollution of interstate waters subject to abatement under the Federal Act;

2. Adequacy of measures taken toward abatement of pollution; and

3. Nature of delays, if any, being encountered in abating the pollution.

The Administrator is also required to make recommendations for remedial action if such recommendations are indicated.

A record and verbatim transcript of the conference is being made by Mrs. Marilyn Hall. This is being made for the purpose of aiding us in preparing a summary and also for providing a complete record of what is said here. It usually takes about 3 or 4 months for the transcript to come out in printed form. If you wish a copy of the record beforehand, or any portion of that record, you should get in touch with Mrs. Hall, who is an independent contractor, and make your own arrangements with her.

I would like to point out that we do not print the transcript in color, so take that into account with any charts or visual aids you may present. They will be reproduced in black and white. Try not to refer to colors if you use these graphic aids in your presentation as they may be meaningless when the transcript is being read.

We will make copies of the summary and transcript available to the State water pollution control agencies as well as the Ohio River Valley Water Sanitation Commission. We have generally found that for the purpose of maintaining relationships within the States, the people who wish summaries and transcripts should request them through their State agency rather than come directly to the Federal Government. The reason for this is that, when the conference has been concluded, we would prefer people who are interested in the problem to follow their normal relations in dealing with the State agencies rather than the Federal Government. This has worked successfully in the past and we will be most happy to make this material available for distribution.

I would suggest that all speakers and participants other than the conferees making statements come to the lectern and identify themselves for purposes of the record.

I am sure many of you people in the audience and certainly the people on the panel here recognize that the enforcement conference we are having on the Monongahela is one of the more unusual ones that we have had in the

United States. Generally enforcement relates to specific violators of the law who can be found and held responsible, and, as will be evident here, a good portion of this problem comes from sources from which no responsible parties can be found.

I think this reflects itself in the character and size of the audience because when we do have specifics and specific people, they tend to be personally interested and the attendance usually is quite a bit larger.

However, because of the subtleties involved in this, we probably have a much more difficult problem to deal with, and I think you should be aware of that as we attempt to apply the enforcement procedures to possibly one of the most vexing problems we have, where you have these diffuse sources.

We have similar problems in applying enforcement procedures in several other river basins in the country such as perhaps the Colorado River, and I don't think the solution or the approach is any easier there.

I give you these words of caution because I think we will have to really recognize the nature of the problem if we are going to follow the conference.

Now, there has been an agenda passed out, but after listening to some of the States, we are going to follow the usual procedure at the conferences. We will hear from the Technical Committee first, and take questions on the report of the Technical Committee; then we will have a Federal recommendation, so these may be before the conferees for the conferees' consideration for the entire conference.

In addition to that, we would expect that anyone who wishes to make a statement to get in touch with his State representative. What we do at the conferences is allow the States to manage their own time and they will put you on.

Our purpose is to hear everyone, and you can be sure that I will be here as long as anyone believes they have something pertinent to say.

We also will, during the presentation, only take comments or questions from the conferees -- and we have quite a few. We do not entertain questions or comments of people from the floor. But you can hold your questions or comments, and you will be given a turn, and you will be given an opportunity to speak, and I think if we do this, we will move ahead rather well.

With that, Mr. Cook, may we have the presentation of the technical report?

MR. COOK: Yes, sir.

First of all, I would like to check and see if there are any representatives of Federal Agencies here who wish to be heard at this time.

COLONEL WEST: I have a meeting to go —

MR. STEIN: Please identify yourself for the record.

COLONEL WEST: My name is Colonel West. I am representing the Army Corps of Engineers, Pittsburgh District.

I have a brief statement that I would like to get into the record of general interest, and I must leave here no later than 20 minutes of 11:00 to meet a Congressman in Rochester, Pennsylvania, and I am not sure how long that meeting will take, whether I will be able to get back this afternoon. I don't want to interfere with your procedures, but if it will be possible to make a statement early I would appreciate it.

MR. STEIN: Well, I think we had — by the way, Colonel West, may we have your first name?

And let me, again, make this point at the beginning. We are preparing a record here, and I think everyone should recognize they are speaking for the record.

COLONEL WEST: The first name is Edward, middle initial "C" as in Charles.

MR. STEIN: I think we will have to go ahead with the report and perhaps we can accommodate you later or —

I don't know how long the conference will go. It may not be completed today. But I do think, in accordance with the suggestion that we have had, we will have to go ahead with the technical report first, and let's try to get to you later. Okay, Colonel?

Do we have any congressional representatives here? If not, let us proceed.

MR. COOK: The Technical Committee Report, prepared by the Division of Field Investigations, EPA, Cincinnati, will be summarized by Andy Sidio, the Director of that organization.

## STATEMENT OF A. D. SIDIO, DIRECTOR,
## DIVISION OF FIELD INVESTIGATIONS,
## ENVIRONMENTAL PROTECTION AGENCY,
## CINCINNATI, OHIO

MR. SIDIO: My name is A. D. Sidio, Director, Division of Field Investigations, Cincinnati.

Mr. Chairman, conferees, ladies and gentlemen. I want to present here a condensation of the report that has been prepared by the Technical Committee to the conferees. That Technical Committee resulted from the first session of this conference. The report prepared by the

Technical Committee to the conferees resulted from the activities of the Monongahela Remedial Project which was set up under the Technical Committee, and the presentation I will make here is a condensation of the larger report which is available for those that are interested moreso than what is included in this condensed document.

MR. STEIN: Do you want the whole report included in the record?

MR. SIDIO: I would like to have this document, and I think it would be most desirable that the entire report of the Technical Committee to the conferees be entered into the record.

MR. STEIN: Without objection, that will be entered into the record as if read.

(The two documents above referred to follow in their entirety.)

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CLEAN WATER

ENFORCEMENT CONFERENCE

MONONGAHELA RIVER & ITS TRIBUTARIES

## SUMMARY REPORT

# MONONGAHELA RIVER MINE DRAINAGE REMEDIAL PROJECT

ENVIRONMENTAL PROTECTION AGENCY

1971

XXXIV

# SUMMARY REPORT
# MONONGAHELA RIVER MINE DRAINAGE
# REMEDIAL PROJECT

Environmental Protection Agency
Div. of Field Investigations - Cincinnati Center

1971

xxx √

Interstate Pollution of Ohio River

Pittsburgh, Pennsylvania Area

## ERRATA SHEET

Page 8, item 5b, delete "cyanide" and "Nickel" from the list of contaminants.

Page 8, add item 5c and 5d, to read as follows:

c. Shall not contain amounts of ammonia that will cause the concentration of ammonia in the receiving stream to exceed 0.5 mg/l of ammonia as Nitrogen.(N)

d. Shall not contain amounts of cyanides that will cause the concentration of cyanides in the receiving stream to exceed 0.025 mg/l.

Page 11, second line from bottom, omit first two words of line, "and population"

Page 63, line 6, for "Ohio", read "Pennsylvania"

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A. Field procedures

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# GLOSSARY OF TERMS

| | |
|---|---|
| at-source control | The application of engineering measures within the immediate environment of a location of mine water formation or discharge to reduce or eliminate the mine drainage pollution capability of that location; exclusive of treatment plants. |
| mine seal | A structure placed in an underground mine opening to reduce or eliminate discharge waters or the pollutional effect of such discharges. Seals may be water-tight and/or air-tight, and may be placed in man-made or naturally-formed openings. |
| site | Any area located and numbered during the field inventory. It is always associated with coal mining or processing and may or may not drain from one or more points. |
| source | A coal mining or related location that produced a measurable discharge at the time of the Monongahela River basin inventory. A source may have one or more discharge points. |

# INTRODUCTION

## STUDY AREA DESCRIPTION

The Monongahela River, 128 miles in length, is formed by the confluence of the West Fork and Tygart Valley rivers at Fairmont, West Virginia. The drainage area of the basin is 7,384 square miles with 2,736 square miles in Pennsylvania, 4,228 square miles in northeastern West Virginia, and 420 square miles in western Maryland. The river flows in a northerly direction and joins the Allegheny to form the Ohio River at Pittsburgh, Pennsylvania. Major tributaries are the Youghiogheny, Cheat, West Fork, and Tygart Valley rivers. The Monongahela Basin is mountainous and has rugged topography with narrow stream valleys several hundred feet below the level of the uplands. The river flows through the Appalachian Plateau region.

In the early 1960's the United States Secretary of Health, Education, and Welfare became increasingly aware that a serious interstate pollution problem was occurring in the Monongahela River Basin. On the basis of reports, surveys, and studies, the Secretary called a conference on August 7, 1963, concerning pollution of the Monongahela River and its tributaries. Discharges of untreated and inadequately treated sewage and industrial waste, including coal mine discharges in West Virginia, were endangering the health and welfare of persons in Pennsylvania, a state other than that in which the discharges originated.

The conference was held December 17-18, 1963, at Pittsburgh, Pennsylvania. Conferees representing the state water pollution control agencies of Pennsylvania, Maryland, and West Virginia, the Ohio River Valley Water Sanitation Commission, and the Department of Health, Education, and Welfare (DHEW) attended the conference. (The responsibilities of the DHEW were transferred from the U. S. Public Health Service to the Federal Water Pollution Control Administration (FWPCA) in January 1966. The FWPCA was transferred from DHEW to the Department of the Interior in May 1966, subsequently renamed the Federal Water Quality Administration, and transferred to the Environmental Protection Agency in December 1970.

The Chairman of the conference pointed out that:

1. Under the Federal Water Pollution Control Act (33 U.S.C. 466 et seq.) pollution of interstate waters which endangers the health or welfare of persons in a state other than the one in which the discharges originate is subject to abatement under procedures described in Section 8 of the Federal Act.
2. The first step of this procedure is the calling of a conference.

3. The purpose of the conference was to bring the states, the interstate agency, and the Department of Health, Education, and Welfare and other interested parties together to review the existing situation and the progress made, to lay a basis for future action by all parties concerned, and to give the states, localities, and industries an opportunity to make any remedial action which may be indicated under state and local law.

The conferees unanimously agreed on the following conclusions and recommendations:

"1. Pollution of an interstate nature exists in the Monongahela River Basin which adversely affects municipal and industrial water supplies, fish and wildlife, and recreation, such as fishing, boating, swimming, and navigation.

2. The states of West Virginia, Pennsylvania, Maryland, and the Ohio River Valley Water Sanitation Commission have made appreciable progress in water pollution abatement and have presented acceptable programs for the control of industrial and municipal wastes.

3. Cognizance is taken of Pennsylvania's program to abate pollution from such sources by the end of 1966. Commensurate programs have been developed by West Virginia and

Maryland. It is recognized that court action may necessarily modify this program and that economically depressed communities in the Basin may have to depend on outside financial assistance.

4. The establishment of a technical committee consisting of representatives of West Virginia, Pennsylvania, Maryland, the Ohio River Valley Water Sanitation Commission, and the Federal Government to explore the means of abating pollution caused by coal mine drainage is recommended. This committee would be charged with determining the amount of pollution from such mines. The committee also would be charged with developing a remedial program, including a cost estimate."

In accordance with recommendation No. 4, the technical committee was established with the recommended representatives. The Committee established the Monongahela River Mine Drainage Remedial Project to carry out the field activities required to fulfill the conferees' recommendations.

## PROJECT OBJECTIVES

At the third meeting of the technical committee of the Monongahela River Enforcement Conference held in Washington, D. C., June 12, 1964, the objectives for the project were reviewed and the following statement of objectives approved.

> "To determine the sources, types, and amounts of pollution from coal mines in the Monongahela River basin, means and cost estimates for abating such pollution."

Following the establishment of the objectives for the project, a scope of work detailing the necessary items to accomplish these objectives was developed. This included the search of existing state records of mines located during the joint federal-state program of 1935-39. Field maps and aerial photos for the study were procured and methods to describe and sample sources were developed (Appendix A).

The actual work of locating, sampling, and describing the sources of mine drainage began in January 1965 and continued through May 1968. This was accompanied by the location of and sampling at stream stations throughout the basin to provide information on the effects of mine drainage on the stream water quality. Laboratory methods used to analyze the samples are described in Appendix B.

The large amount of data and variety of information to be acquired necessitated the use of automatic data processing methods. This was accomplished as described in Appendix C.

Further programs, other than those for the initial data retrieval, were developed for use in analyzing the data as well as to improve capabilities of storing, up-dating and retrieving data. These also are described in Appendix C. For purposes of inventory and reporting of results, the total area of the Monongahela Basin was sub-divided into thirty smaller drainage areas as described later. More detailed reports have been prepared on each sub-basin and are appended as Appendix F.

# SUMMARY OF FINDINGS

During the inventory, which continued from January 1965 through May 1968, a total of 7,002 sites associated with coal mining were located and described. The relative distribution of the mines and associated sites that were inventoried is shown in Table 1. Inactive sites constituted 92 percent of the total. Inactive drift mines constitute nearly one-half of the sites and inactive strip mines account for about one-third of the sites.

Of the 7,002 mine and mine-associated sites, 3,046 were draining at the time of the inventory. The distribution of the draining sources by type and the pollutional contribution of each type is shown in Table 2. Table 3 is a percentile presentation of the data in tables 1 and 2. The following items are of particular significance (from Table 3):

1. Inactive sites comprised 92 percent of all sites, 90 percent of the draining sites, and contributed 65 percent of the net acid load and 60 percent of the iron load.
2. Active sites comprised only 8 percent of all sites and 10 percent of the draining sites, but even with the treatment plants existing at the time of the

inventory the active sites contributed 35 percent of the net acid load and 40 percent of the iron load.

3. Underground sites, both active and inactive, comprised 55 percent of all sites, 61 percent of the draining sites, and contributed 71 percent of the net acid load and 82 percent of the iron load. Inactive underground sites contributed 43 percent of the net acid load and 47 percent of the iron load and thus are the largest contributors to stream degradation.

If it is assumed that the drainage from combination underground-surface sites originates primarily in the underground mines, then underground mines were responsible for nearly 88 percent of the net acid and 91 percent of the iron entering Monongahela River basin streams. By this assumption, the contribution of inactive underground mines was about 55 percent of the net acid and 54 percent of the iron.

In addition to the overall statistics, the relative distribution of pollution contributing sites within the Monongahela River basin is of importance. It was found that:

1. The pollutional contribution from all types of active mines was greatest in the Middle and Upper Monongahela River, Lower West Fork River, Lower Tygart River, Lower Cheat River, Lower Youghiogheny River, and Sewickley

Creek sub-basins (Table 4). Discharges from active underground mines were the primary source of stream degradation only in the Upper Monongahela River sub-basin.

2. Water quality in watersheds in the central portion of the Monongahela River basin was degraded by pollutants from both active and inactive mine sources, and water quality in the headwaters areas was degraded principally by pollutants from inactive mine sources.
3. It was generally true that a relatively small number of sources in an area contributed most of the pollution. This becomes apparent upon detailed study of the individual sub-basins. The average amount of net acid contributed per source varied greatly among the sub-basins.

The Monongahela River is more intensely polluted by mine drainage than any other major river in the United States. Degraded conditions are widespread in most of the principal tributary watersheds. Only minor areas of the basin that contain no mined coal beds are free from the pollutional effects of mine drainage.

Specific mine drainage stream pollution problems within the Monongahela River basin are: high concentrations of acidity, iron, manganese, sulfate, and hardness; low pH; and turbidity and bottom deposits of chemical precipitates. Siltation caused by runoff from mining activities often causes severe local stream pollution problems. Control of this source of pollution is necessary.

Mine drainage affects water uses in various ways. To many, the most dramatic effects of mine drainage pollution are in the destruction of fish and other aquatic life and impairment to stream appearance. Mine drainage pollution affects the use of water for municipal and industrial water supply by increasing the costs for equipment and water treatment. Additional damaging effects of mine drainage are the increase in corrosiveness to boats, dams, and other structures that are in contact with the water.

Estimates have been made of the total lengths of the streams in the basin that were affected by mine drainage. Mileage figures are presented in the form of sub-basin totals (Table 5). The mileage determinations are based on field observations, analytical data, and knowledge of mine drainage source locations. Results of the study reveal that 2,410 miles of streams were affected by mine drainage (Table 4). An affected stream is considered one that had been observed to contain mineralization from mine drainage in concentrations noticeably in excess of background levels.

In the right-hand column of Table 4 are listed the ratio of the stream miles affected by mine drainage in each sub-basin to the estimated total miles of streams. In this way, a relative factor is assigned for each defined study area to provide a basis of comparison for the linear magnitude of the pollution problem throughout the basin.

Table 1

## SUMMARY OF TOTAL SITES INVENTORIED IN THE MONONGAHELA RIVER BASIN

| Site Type | Inactive Sites | & of Total | Active Sites | % of Total | Total Sites | % of Total |
|---|---|---|---|---|---|---|
| Preparation Plant | 42 | 0.6 | 54 | 0.8 | 96 | 1.4 |
| Strip Mines | 2,322 | 33.2 | 149 | 2.1 | 2,471 | 35.3 |
| Strip & Auger Mines | 65 | 0.9 | 14 | 0.2 | 79 | 1.1 |
| Drift Mines | 3,373 | 48.2 | 278 | 4.0 | 3,651 | 52.1 |
| Strip & Drift Mines | 450 | 6.4 | 32 | 0.5 | 482 | 6.9 |
| Shaft or Slope Mines | 170 | 2.4 | 33 | 0.5 | 203 | 2.9 |
| Refuse Piles | 17 | 0.2 | 1 | - | 18 | 0.3 |
| Shaft & Strip Mines | 1 | - | 0 | - | 1 | - |
| Coal Storage Areas | 1 | - | 0 | - | 1 | - |
|  | 6,441 | 91.9 | 561 | 8.1 | 7,002 | 100.0 |

Table 2

## SUMMARY OF DRAINING SITES IN THE MONONGAHELA RIVER BASIN

| SITE TYPE | NO. OF SITES | TOTAL NET ACIDITY (lbs/day) | TOTAL IRON (lbs/day) |
|---|---|---|---|
| Preparation Plants (active) | 33 | 9,541 | 2,912 |
| Preparation Plants (inactive) | 5 | 1,044 | 113 |
| Shaft or Slope Mines (active) | 21 | 73,645 | 43,023 |
| Shaft or Slope Mines (inactive) | 24 | 33,910 | 27,622 |
| Strip Mines (active) | 53 | 14,428 | 3,911 |
| Strip Mines (inactive) | 738 | 92,012 | 15,043 |
| Drift Mines (active) | 164 | 224,076 | 62,367 |
| Drift Mines (inactive) | 1,655 | 436,049 | 114,384 |
| Strip & Drift Comb. Mines (active) | 26 | 56,549 | 7,973 |
| Strip & Drift Comb. Mines (inactive) | 263 | 120,565 | 20,807 |
| Strip & Auger Mines (active) | 8 | 1,444 | 1,275 |

Table 2 (Cont.)

## SUMMARY OF DRAINING SITES IN THE MONONGAHELA RIVER BASIN

| SITE TYPE | NO. OF SITES | TOTAL NET ACIDITY (lbs/day) | TOTAL IRON (lbs/day) |
|---|---|---|---|
| Strip & Auger Mines (inactive) | 47 | 13,402 | 2,453 |
| Refuse Areas (active) | 1 | 0 | 0 |
| Refuse Areas (inactive) | 7 | 2,910 | 1,013 |
| Shaft & Strip Mines (inactive) | 1 | 0 | 0 |
| TOTALS | 3,046 | 1,079,575 lbs/day | 302,896 lbs/day |
| Dry Sites | 3,956 | | |
| TOTAL | 7,002 | | |

Table 3

## PERCENTILE PRESENTATION OF DATA IN TABLE 1 AND 2

| | Underground Mines[1] | Surface Mines[2] | Combination Surface and Underground[3] | Other Sites[4] | Total Percentages |
|---|---|---|---|---|---|
| Percent of Total Sites (Table 1) | | | | | |
| Active Sites | 4 | 2 | 1 | 1 | 8 |
| Inactive Sites | 51 | 34 | 6 | 1 | 92 |
| Total | 55 | 36 | 7 | 2 | 100 |
| Percent of Draining Sites (Table 2) Total Sites | | | | | |
| Active Sites | 6 | 2 | 1 | 1 | 10 |
| Inactive Sites | 55 | 26 | 9 | 0 | 90 |
| Total | 61 | 28 | 10 | 1 | 100 |
| Percent of Net Acidity | | | | | |
| Active Sites | 27.6 | 1.4 | 5.2 | 0.9 | 35.1 |
| Inactive Sites | 43.5 | 9.8 | 11.2 | 0.4 | 64.9 |
| Total | 71.1 | 11.2 | 16.4 | 1.3 | 100.0 |
| Percent of Total Iron | | | | | |
| Active Sites | 34.8 | 1.7 | 2.6 | 0.9 | 40.0 |
| Inactive Sites | 46.9 | 5.8 | 6.9 | 0.4 | 60.0 |
| Total | 81.7 | 7.5 | 9.5 | 1.3 | 100.0 |

1. Includes drift and shaft mines.

2. Includes strip and auger mines.

3. Includes strip and drift combination mines.

4. Includes refuse piles, preparation plants, a coal storage area, and a strip and shaft mine.

Table 4

## MONONGAHELA RIVER BASIN
## SUMMARY OF INVENTORY DATA

| SUB-BASIN No. | Name | AREA (sq.mi.) | STREAM LENGTH Total (mi.) | Affected (mi.) | NUMBER DRAINING SITES | SITE LOADS lbs/day Net Acid | Iron | ESTIMATED COST |
|---|---|---|---|---|---|---|---|---|
| 1 | Lower Monongahela R. | 316 | 474 | 173 | 232 | 12,400 | 9,069 | $ 974,500 1/ |
| 2 | Redstone & Dunlap C. | 151 | 226 | 99 | 20 | 21,203 | 18,352 | 2,310,500 2/ |
| 3 | Tenmile C., Pa. | 338 | 507 | 81 | 53 | - 838 | 2,094 | 104,000 |
| 4 | Middle Monongahela R. | 264 | 396 | 199 | 125 | 50,434 | 16,426 | 1,620,250 |
| 5 | Dunkard C. | 234 | 351 | 28 | 30 | 10,994 | 4,506 | 742,000 |
| 6 | Upper Monongahela R. | 293 | 440 | 180 | 195 | 233,453 | 64,844 | 2,576,500 |
| 7 | Buffalo & Paw Paw C. | 173 | 260 | 42 | 13 | 12 | 934 | None |
| 8 | Lower West Fork R. | 250 | 375 | 171 | 402 | 201,195 | 48,029 | 12,368,350 |
| 9 | Tenmile C., W. Va. | 125 | 188 | 37 | 64 | 8,945 | 4,185 | 970,500 |
| 10 | Elk C. | 121 | 182 | 96 | 109 | 36,086 | 12,586 | 1,976,000 |
| 11 | Upper West Fork R. | 386 | 579 | 146 | 224 | 8,539 | 2,115 | 3,910,000 |
| 12 | Lower Tygart R. | 191 | 287 | 123 | 185 | 65,902 | 13,477 | 4,451,500 |
| 13 | Middle Tygart R. | 313 | 470 | 140 | 146 | 8,061 | 1,195 | 1,879,500 |
| 14 | Buckhannon R. | 309 | 464 | 64 | 268 | 3,229 | 1,191 | 4,718,650 |

---

1/ Sum of $44,000 for at-source mine drainage control and $930,500 initial cost for construction of treatment plants. An annual operating cost of $271,700 is estimated for the treatment plants.

2/ Sum of $1,100,000 for at-source mine drainage control and $1,210,500 initial cost for construction of treatment plants. An annual operating cost of $353,500 is estimated for the treatment plants.

(Continued on next page)

Table 4 (Cont.)

## MONONGAHELA RIVER BASIN
## SUMMARY OF INVENTORY DATA

| SUB-BASIN No. | Name | AREA (sq.mi.) | STREAM LENGTH Total (mi.) | Affected (mi.) | NUMBER DRAINING SITES | SITE LOADS lbs/day Net Acid | Iron | ESTIMATED COST |
|---|---|---|---|---|---|---|---|---|
| 15 | Middle Fork R. | 151 | 227 | 19 | 67 | 1,192 | 113 | 975,000 |
| 16 | Upper Tygart R. | 347 | 521 | 22 | 41 | 7,195 | 353 | 1,416,000 |
| 17 | Leading C. | 60 | 90 | - | - | - | - | None |
| 18 | Lower Cheat R. | 170 | 255 | 144 | 145 | 140,031 | 26,907 | 3,071,500 |
| 19 | Big Sandy C. | 208 | 312 | 68 | 42 | 1,496 | 160 | 858,100 |
| 20 | Upper Cheat R. | 330 | 495 | 30 | 100 | 19,958 | 5,166 | 1,447,500 |
| 21 | Shavers Fork | 215 | 323 | 42 | 32 | 763 | 73 | 486,250 |
| 22 | Blackwater R. Area | 499 | 749 | 44 | 53 | 11,816 | 1,282 | 925,000 |
| 23 | Lower Youghiogheny R. | 259 | 389 | 106 | 106 | 76,019 | 21,175 | 2,388,000 |
| 24 | Sewickley C. | 168 | 252 | 41 | 58 | 90,144 | 37,496 | 6,261,500 |
| 25 | Middle Youghiogheny R. | 149 | 224 | 68 | 29 | 3,185 | 622 | 1,074,000 |
| 26 | Mounts & Indian C. | 157 | 236 | 28 | 58 | 10,076 | 1,639 | 499,000 |
| 27 | Youghiogheny R. West | 183 | 275 | 30 | 17 | 783 | 162 | 263,000 |
| 28 | Laurel Hill C. | 125 | 188 | 4 | 12 | 30 | 3 | 185,000 |
| 29 | Casselman R. | 465 | 698 | 125 | 183 | 55,576 | 8,512 | 3,589,000 |
| 30 | Upper Youghiogheny R. | 434 | 651 | 60 | 37 | 1,692 | 228 | 198,500 |
|  | TOTALS | 7,384 | 11,084 | 2,410 | 3,046 | 1,079,575 | 302,896 | 62,239,600 |

Table 5

## MILES OF STREAMS IN THE MONONGAHELA RIVER SUB-BASINS AFFECTED BY MINE DRAINAGE

| Sub-Basin No. | Sub-Basin | Total Miles of Streams* | Miles Affected | Ratio miles affected/ Total miles |
|---|---|---|---|---|
| 1 | Lower Monongahela River | 474 | 173 | .36 |
| 2 | Redstone & Dunlap Creeks | 226 | 99 | .44 |
| 3 | Tenmile Creek, Pa. | 507 | 81 | .16 |
| 4 | Middle Monongahela River | 396 | 199 | .50 |
| 5 | Dunkard Creek | 351 | 28 | .08 |
| 6 | Upper Monongahela River | 440 | 180 | .41 |
| 7 | Buffalo & Paw Paw Creeks | 260 | 42 | .16 |
| 8 | Lower West Fork River | 375 | 171 | .46 |
| 9 | Tenmile Creek, W. Va. | 188 | 37 | .20 |
| 10 | Elk Creek | 182 | 96 | .53 |
| 11 | Upper West Fork River | 579 | 146 | .25 |
| 12 | Lower Tygart Valley River | 287 | 123 | .43 |
| 13 | Middle Tygart Valley River | 470 | 140 | .30 |
| 14 | Buckhannon River | 464 | 64 | .14 |
| 15 | Middle Fork River | 227 | 19 | .08 |
| 16 | Upper Tygart Valley River | 521 | 22 | .04 |
| 17 | Leading Creek | 90 | ** | ** |
| 18 | Lower Cheat River | 255 | 144 | .56 |
| 19 | Big Sandy Creek | 312 | 68 | .22 |
| 20 | Upper Cheat River | 495 | 30 | .06 |
| 21 | Shavers Fork | 323 | 42 | .13 |
| 22 | Blackwater River Area | 749 | 44 | .06 |
| 23 | Lower Youghiogheny River | 389 | 106 | .27 |
| 24 | Sewickley Creek | 252 | 41 | .16 |
| 25 | Middle Youghiogheny River | 224 | 68 | .30 |
| 26 | Mounts and Indian Creeks | 236 | 28 | .12 |
| 27 | Youghiogheny River West | 275 | 30 | .11 |
| 28 | Laurel Hill Creek | 188 | 4 | .02 |
| 29 | Casselman River | 698 | 125 | .18 |
| 30 | Upper Youghiogheny River | 651 | 60 | .09 |
|  | Totals | 11,084 | 2,410 | .22 |

*Estimated values obtained by multiplying the drainage area by 1.5 miles of streams per square mile.

**No mining in the basin.

As indicated by the ratios, the Laurel Hill Creek and Upper Tygart Valley River areas were affected only slightly. In the Lower Cheat River, Elk Creek, Middle Monongahela River, Lower West Fork River, Lower Tygart Valley River, Redstone and Dunlap creeks, and the Upper Monongahela River sub-basins, 40 percent or more of the streams were affected.

Generally, alkaline surface water within the basin occurs in small tributaries located in the northwestern and southern extremities of the study area. With this general exception, surface waters of the basin are acidic or marginally acidic as a result of coal mine drainage. Waters of the Monongahela Basin not affected by acid mine drainage are generally only slightly alkaline "or buffered" with limited acid neutralization capacity. Small amounts of acid drainage seriously affect these streams.

It is startling to realize that less than an 18 percent depletion of the original bituminous coal resource has resulted in the vast mine drainage pollution problem that now exists in the Monongahela River Basin.

Active draining sites contributed about 35 percent of the net acid and 40 percent of the total iron entering Monongahela basin streams from coal mines (Table 3). The control of pollution from active mines is considered to be the responsibility of the min operator, with the regulations for control established and enforced by the state governments.

ORSANCO Resolution No. 5-60 and the operating, planning, and administrative techniques relating to practical application as suggested in "Principles and Guide to Practices in the Control of Acid Mine Drainage" provide a basis to minimize the formation of acid drainage from active mines. The three states have the basic laws necessary for the control of drainage from active coal mining operations, both surface and underground. Each of the three states also has surface mine reclamation laws. Pennsylvania and West Virginia have the authority to control the abandonment of underground coal mines, but Maryland does not presently have such authority.

Since the site inventory was started, Pennsylvania has developed an effective program for the control of drainage from active coal mining operations. Contour or terrace backfilling of strip mines has been required since 1963. A remaining area of technical difficulty in Pennsylvania is the control of drainage following the abandonment of underground mines that were opened prior to 1965, since these mines were not subject to the same pre-planning constraints that went into effect during that year. Regulation of mine drainage pollution is also hampered because the mining of other minerals is not subject to the same regulations as are mining operations for coal until the operation develops a polluting discharge. At that time the mining operation becomes subject to the same regulations as the coal mining operation.

West Virginia had the earliest surface mining law of any state (1946) and has a generally effective program for the reclamation of land disturbed by active and inactive or "orphaned" surface mines. The legal authority to control pollution from active deep mines has existed for some time, but progress has been hindered because of the lack of personnel and funds. As of July 1, 1969, the Division of Water Resources, Department of Natural Resources, was given the authority to control the opening, re-opening, operating, and abandonment of all deep mines, quarries, or preparation plants, but the implementation of this authority will be dependent on financial constraints related to regulatory agency needs.

Inactive or abandoned mines contributed about 65 percent of the net acid entering streams in the basin from coal mines, and 43 percent originated in underground sources.

Abating pollution from inactive mines is a task the cost and success of which are difficult to accurately predict at this time. The difficulty derives from the fact that there is little experience with watershed-scale abatement projects upon which to base estimates.

Order-of-magnitude cost estimates have been prepared to indicate the potential amount that might be necessary to implement a comprehensive program for abating pollution from inactive mines. The estimated number of underground openings and surface acres that require remedial measures multiplied by average estimated cost figures are listed in Table 6. The total of these costs is approximately $60,000,000. In two sub-basins, No 1 and 2, a total of six lime neutralization treatment plants with an initial construction cost of an additional $2,141,000 and an annual operating cost of $625,200 are recommended. To this must be added the costs of engineering design, acquisition of land and mineral rights, the costs of maintaining the constructed facilities, and other miscellaneous costs. There is no way to estimate such costs as acquisition of land and mineral rights at this time. In a comprehensive program, such costs could be great, since areas might be involved that include substantial minable coal reserves.

A major defect in the cost estimate is considered to be the cost for underground mine sealing. This estimate is considered defective because the history of early underground mining and subsequent strip mining that is common in the Monongahela basin created more openings to underground mines than originally existed and left many of these openings covered. Preliminary surveys of the present type are not adequate in such situations. If the assumption were made that all areas would be as complex as ones that have been examined in detail in the Upper West Fork River area and in the Upper Tygart River area, the cost of mine sealing alone could be more than ten times the amount shown in Table 6, or more than $486 million.

The initial estimated cost of a comprehensive program for at-source control of acid mine drainage from inactive sites in the

Table 6

## ESTIMATED ABATEMENT COSTS

| ABATEMENT TECHNIQUE | ESTIMATED NUMBER OF UNITS REQUIRED | UNIT COST | TOTAL COST |
|---|---|---|---|
| Surface Mine Reclamation | 8,954 acres | $500/acre | 4,477,000 |
| Subsidence Reclamation | 1,682 acres | $2000/acre | 3,364,000 |
| Refuse Pile Reclamation | 1,786 acres | $2000/acre | 3,572,000 |
| Seals to Underground Mine Openings | 3,241 seals | $15,000/each | 48,615,000 |
| Diversion Ditch | 26,400 ft. | $1.50 ft. | 39,600 |
| Reforestation of Strips | 155 acres | $200/acre | 31,000 |
| Treatment Plants | 6 plants<br>17 tons/day net acid | $125 000/ton/day construction | 2,141,000* |

Total Construction Costs = $62,239,600

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* An annual operating cost of $625,200, based upon $100/ton/day, is estimated for the 6 plants. The plants are suggested for sub-basins 1 and 2 only.

Monongahela Basin would exceed 60 million and might be greater than 498 million. Calculations of data from the Monongahela River Basin inventory have shown that problems exist in determining definite pollutional load values due to variations in hydrogeologic conditions. This also has been true in arriving at methods to be used for the control of mine drainage. The total aspect of mine drainage treatment or control is a vastly complicated problem. Definite procedures to be used for loading evaluation, treatment or control methods, and the resultant cost analyses for the partial or complete solution to the problem are not possible, based on the type of information requested and obtained. Experience has indicated that because of mining methods and mine conditions the number of openings is often as much as 10 times the number visible. To be completely effective, the program would need to be supplemented by treatment. If at-source control of drainage from inactive sources were only 50 percent effective, then treatment plants would be required. Present data indicate that the initial investment in treatment plants to neutralize the remaining net acidity from all inactive sources, exclusive of subbasins 1 and 2, would be in the order of $21,000,000 and plant annual costs would be about $6,132,000. The total estimated cost for the additional water treatment over a 20-year period would be about $144,000,000. The cost of the collection systems to transport mine water to the treatment plants may be from one to 20 times more than the cost of the plants. Total estimated costs for at-source abatement and water treatment range from $218 million to $656 million for a 20-year period.

It should be reemphasized that these costs are only presented to indicate the order of magnitude of funds required. Meaningful estimates can only be obtained by working with small representative areas on a trial abatement basis to obtain data that are reliable and representative.

## RECOMMENDATIONS

The technical committee of the Monongahela River Enforcement Conference has agreed to, and submits to, the conferees the following recommendations:

1. A Remedial Project committee for the Monongahela River Basin be established to direct and coordinate the abatement programs recommended by the conferees. The committee shall be comprised of representatives of West Virginia, Pennsylvania, Maryland, ORSANCO, and the Federal Government.
2. In the event that funds are made available for application to the abatement of mine drainage in the Monongahela Basin, that appropriate State, Interstate, and Federal agency delegations of authority be given to respective State, Interstate, and Federal officials who are members of the Remedial Project committee to enable said officials to commit the allocated funds.
3. The Remedial Project committee be chaired by the Federal representative and be charged with, but not limited to, the following responsibilities:

(a) to develop methods to assign priorities to areas or sub-basins that are to receive abatement measures. These methods shall be based on sound technical principles consistent with attainment of the established water quality standards;

(b) to establish priorities for areas or sub-basins in accordance with the methods developed;

(c) to have prepared more finite estimates on the cost of selected projects;

(d) to review and evaluate State programs in the basin for abatement of present and future pollution from active mining operations;

(e) to evaluate progress and accomplishments of abatement projects;

(f) to determine financial assistance required by the States to carry out selected abatement projects;

(g) to prepare progress reports for submission to the conferees and the Secretary of the Interior by July 1 of each year.

4. The FWPCA provide the technical staff to assist the Remedial Project committee in accomplishing the assigned responsibilities.

5. A legal study be financed by the FWPCA covering an analysis of legal problems in abatement and control of

water pollution from mining and associated functions. Model legislation be developed based on:

(a) a study of patterns of ownership of mineral rights in the Basin.

(b) a study of possible State legislation aimed at determining methods to:

1. obtain right of entry for reclamation work.
2. assure public benefit from reclamation work.

6. The State governments will adopt and enforce a program to: abate present and future pollution from active mining operations; establish and define who will be responsible for preventing pollution from mines that are presently active and will be inactivated in the future, as well as the establishment of this responsibility for all future mines prior to their development; and develop a program for maintenance and operation of abatement facilities and measures.

7. That the sum of $5,000,000 be made available to be used for the purpose of initiating engineering studies to determine specific project costs, and to fund agreed to projects. As finite engineering estimates are completed, funds would then be requested in accordance with State plans and priorities as established by the Remedial Project committee.

These initial projects would indicate the degree of effectiveness and feasibility of basin-wide mine drainage control.

In addition, these projects would provide a means for the Remedial Project committee to refine the rough estimates prepared from the existing inventory.

Recommendations were submitted by each member of the technical committee. A copy of each submission is included as Attachment B.

# CHARACTERISTICS OF THE MONONGAHELA BASIN

## PHYSIOGRAPHY

The Monongahela River basin has a drainage area of 7,384 square miles of which 4,225 square miles is in northern West Virginia, 2,736 square miles is in southwestern Pennsylvania, and 420 square miles is in northwestern Maryland (Figures 1 and 2).

The basin is bounded on the west by the Ohio River mainstem drainage, on the south by the Little Kanawha and Kanawha River drainage, on the east by the Potomac River drainage, and on the north by the Allegheny River drainage. The basin is about 75 miles wide from east to west and about 130 miles long from north to south.

The Monongahela River basin in West Virginia is located in all of Marion, Monongalia, Preston, Harrison, Taylor, Barbour, and Tucker Counties, much of Randolph, Upshur, and Lewis Counties, and a small part of northern Pocahontas County. The basin in Pennsylvania is located in all of Fayette County, and in parts of Allegheny, Washington, Greene, Westmoreland, and Somerset Counties. The basin in Maryland is only in Garrett County.

The basin is located in the Appalachian Plateaus physiographic province, mostly in the Kanawha section and partly in the

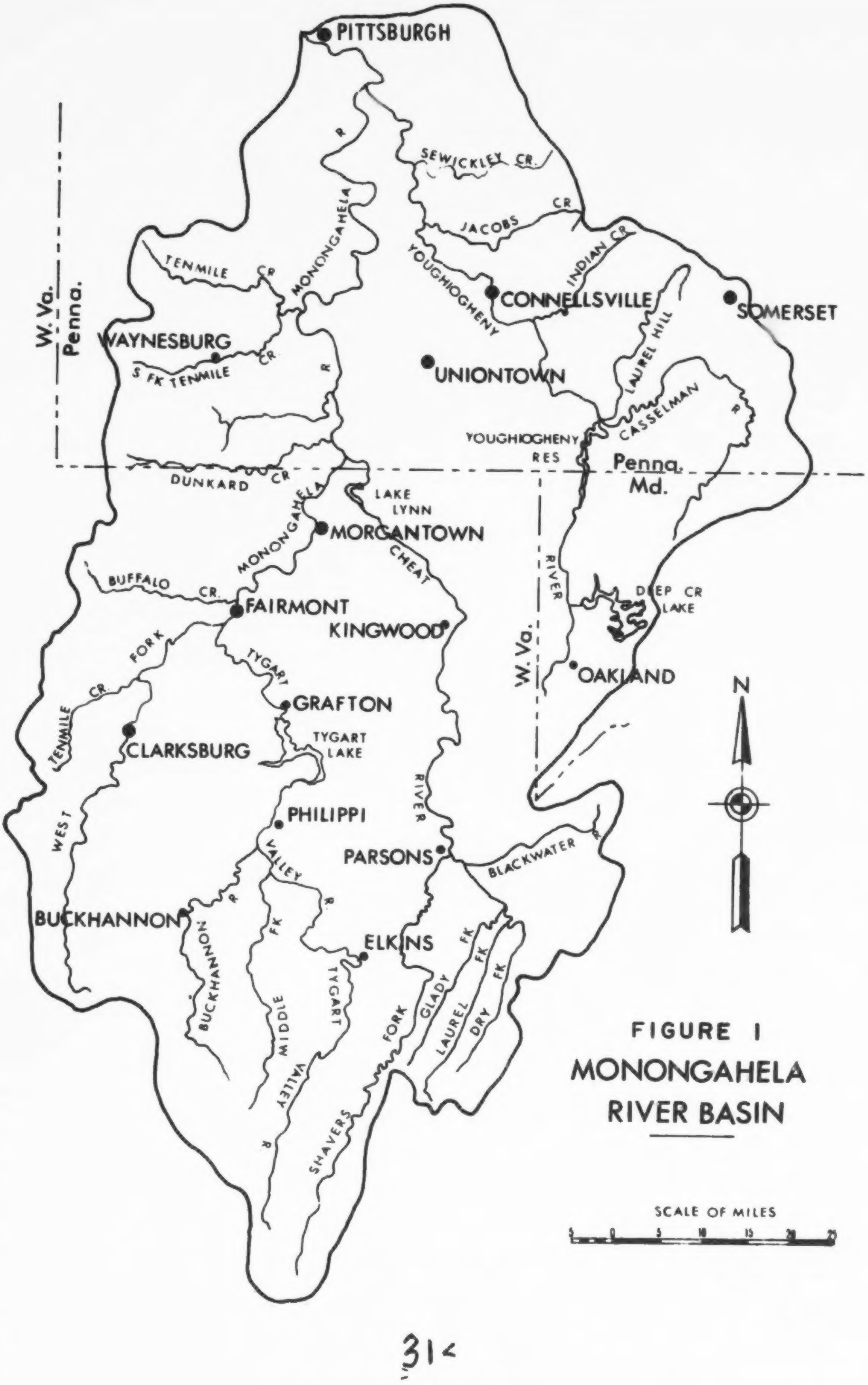

FIGURE 1
MONONGAHELA
RIVER BASIN

## Key to Figure 2

### Sub-Basin Areas of the Monongahela River Basin

1. Lower Monongahela River
2. Redstone Creek and Dunlap Creek
3. Tenmile Creek, Pennsylvania
4. Middle Monongahela River
5. Dunkard Creek
6. Upper Monongahela River (excluding Buffalo Creek and Paw Paw Creek area).
7. Buffalo Creek and Paw Paw Creek
8. Lower West Fork River (except Tenmile Creek, W. Va. area)
9. Tenmile Creek, West Virginia
10. Elk Creek
11. Upper West Fork River
12. Lower Tygart Valley River
13. Middle Tygart Valley River
14. Buckhannon River
15. Middle Fork River
16. Upper Tygart Valley River (excluding Leading Creek)
17. Leading Creek
18. Lower Cheat River (excluding Big Sandy Creek)
19. Big Sandy Creek

20. Upper Cheat River

21. Shavers Fork

22. Blackwater River Area

23. Lower Youghiogheny River to Westmoreland-Fayette County line

24. Sewickley Creek

25. Middle Youghiogheny River from Westmoreland-Fayette County line to Connellsville, Pennsylvania

26. Mounts Creek and Indian Creek (including minor drainage on east bank of Youghiogheny River)

27. Youghiogheny River West, from Connellsville to Confluence, Pennsylvania

28. Laurel Hill Creek

29. Casselman River

30. Upper Youghiogheny River

Allegheny Mountains section. The area is a mature plateau of relatively fine texture with moderate to strong relief, and erosion has reduced most of the land area to slope. The terrain is most rugged in the eastern part of the basin where valleys are deep and narrow. The western part of the basin has a more subdued topography. The flatter areas in the basin are limited to narrow flood plains along major streams, some terraces, and flat-topped hills and ridges. Elevations range from 4,600 feet above sea level in the Cheat River basin to as low as 700 feet above sea level at the mouth of the Monongahela River.

The Monongahela River is formed by the confluence of the West Fork and the Tygart Valley Rivers at Fairmont, Marion County, West Virginia. The Monongahela flows generally northward and is joined by the Cheat River at Point Marion, Pennsylvania, and the Youghiogheny River at McKeesport, Pennsylvania. The Monongahela flows 128 river miles from Fairmont, W. Va., to Pittsburgh, Pa., where it joins the Allegheny River to form the Ohio River.

The major tributaries to the Monongahela River are the Youghiogheny River, the Tygart Valley River, the West Fork River, and the Cheat River (Figure 1).

The Youghiogheny River, which drains the northeastern part of the basin, flows generally northwestward and joins the Monongahela River at McKeesport, Allegheny County, Pa.

The Tygart Valley River rises in southern Randolph County, W. Va., on the eastern edge of the Appalachian Plateau and flows generally northward to Fairmont, Marion County, W. Va. The Buckhannon River drains part of the Appalachian Plateau and is a tributary to the Tygart Valley River at a point upstream from Philippi, Barbour County, W. Va.

The West Fork River, which drains the southwestern part of the basin, rises in southern Lewis County, W. Va., and flows generally northward to Fairmont in Marion County.

The Cheat River is formed by the confluence of Black Fork and Shavers Fork Rivers at Parsons in Tucker County, W. Va. The Cheat and its tributaries drain most of the southeastern portion of the basin in the Allegheny Mountains. The major headwater tributaries that form the Cheat River rise in Randolph County, W. Va. The Cheat flows generally northward and joins the Monongahela River at Point Marion, Fayette County, Pa.

The eastern part of the Monongahela basin is located principally in the Allegheny Mountains, where elevations over 3,000 feet are common and locally exceed 4,000 feet. The area has steep stream gradients and very rocky channels. The valley of the Cheat River is more than 1,300 feet below the adjoining ridges in Tucker, Preston, and Monongalia Counties. Major anticlinal structures and erosion have exposed much older rock systems, which have long and narrow outcrop patterns on the major structures. The southeastern part of the basin has a trellis drainage pattern as a result of erosion control by the northeast-trending resistant sandstone ridges that dominate the landscape. In the downstream reaches of the larger streams, deep water gaps have been cut through the high ridges.

The western plateau part of the basin is drained by the Monongahela main stem, the Tygart Valley River, the West Fork River, and minor tributaries. This area is part of the large section of a mature intricately dissected plateau whose topography and geology are characteristic of the unglaciated Appalachian Plateaus physiographic province. The land is principally a maze of deep-sided valleys and narrow winding ridges that were formed in the alternating sandstones and shales of the Pennsylvanian and Permian ages. Regionally, the relatively flat-lying rocks form broad and irregular shaped outcrop areas.

## HYDROLOGY

The average annual precipitation in the basin ranges from about 36 to 70 inches depending on altitude, terrain, and exposure. The maximum precipitation occurs in the eastern mountainous part of the basin, and the minimum precipitation occurs near the extreme northern part of the basin. Frequency, intensity, and duration of precipitation vary with the area and season; droughts that affect agriculture are not uncommon. Evaporation and transpiration by vegetation return about half of the precipitation to the atmosphere. Heavy rainfalls cause regional flooding in the spring, but in general only local flooding occurs during the summer.

## Surface Water

Streamflow in the Monongahela River basin is regulated in part by multiple-purpose dams and headwater reservoirs. The four existing impoundments are Tygart Lake and Youghiogheny Reservoirs, which are operated by the U. S. Army Corps of Engineers, and Lake Lynn and Deep Creek Lake, which are operated by private power companies. They have a total storage of 429,000 acre-feet for flood protection and 590,970 acre-feet for other uses such as hydroelectric power generation, navigation, and recreation. Lake Lynn and Deep Creek Lake are operated for the purpose of producing electric power and have a combined storage capacity of 341,770 acre-feet. Storage in Tygart Lake is released to maintain a minimum flow of 340 cubic feet per second (cfs) at the lock and dam at Fairmont, W. Va., on the Monongahela River.

The Rowlesburg and Stonewall Jackson Reservoirs, under study by the Corps of Engineers, would provide an additional 337,600 acre-feet of storage for flood control and 617,700 acre-feet for regulation of streamflow for purpose of water quality control, hydroelectric power generation, and as a source of municipal water supply.

In the basin's 7,384 square mile drainage area, the present impoundments on the Tygart, Youghiogheny, and Cheat rivers control the flow from a total of 3,031 square miles. The proposed Stonewall Jackson Reservoir would increase this amount by an additional 102 square miles.

The mean annual runoff for the period of record of 1939-1959 in the Monongahela River basin at Braddock, Pa., was 23.1 inches. The maximum runoff was 31.0 inches and the minimum runoff was 12.9 inches. A selected summary of streamflow data based primarily on records of the U. S. Geological Survey is presented in Table 7.

The magnitude and probable frequency of low flows are needed in the design of systems that control and utilize surface water. Low flows vary considerably throughout the basin in runoff per square mile, mainly because of variations in precipitation and difference in geology.

The streams of the Upper Cheat River drainage area have a low variability of flow as compared with other streams of the Monongahela River basin. This is principally because that area is underlain by rocks of relatively high transmissibility that tend to maintain a more constant base flow. The Blackwater River is the least variable because of the relatively flat land slope and natural water storage in the spongy soil of the high swamp areas above Davis, Tucker County, W. Va. The low flows in the eastern

Table 7

## FLOW OF SELECTED STREAMS -- MONONGAHELA RIVER BASIN

| Stream & Station | Drainage Area (Sq Mi) | Period of Record | Average Discharge for Period of Record |  | Instantaneous Maximum Discharge |  | Instantaneous Minimum Discharge |  | Consecutive 7 Day Minimum Discharge |  | Select 7 Day 10 Year Low Flow (cfs)(12) |
|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  | (cfs) | (1000 AF/Yr) | (cfs) | Date | (cfs) | Date | (cfs) | Period |  |
| Tygart Valley Riv. Belington, W Va | 408 | 1907-59 | 789 | 571 | 18,400 | 7-25-12 | 0.1 (2) | 9-13-30 | 0.2 | 9-(13-19)-30 | 4.2 |
| Tygart Valley Riv, Philippi, W Va | 916 | 1940-59 | 1,824 | 1,321 | 33,600 | 10-16-54 | 4.9 (2) | 10-(10-12,21)-53 | 5.2 | 10-(16-22)-53 | 8 |
| Tygart Valley Riv, Colfax, W Va | 1,366 | 1939-59 | 2,607 | 1,887 | 22,500 | 2-14-48 | 94 (2) | 7-3-46 | 132 | 5-(1-7)-41 | 192 |
| West Fork Riv, Enterprise, W Va | 759 | 1907-18;<br>1932-59 | 1,170 | 847 | 31,400 | 2-14-48 | 3.4 (2) | 7-27-34 | 6.4 | 10-(16-22)-39 | 11 |
| Monongahela Riv, Hoult, W Va | 2,388 | 1915-26;<br>1938-59 | 4,120 | 2,983 | 91,500 | 1-2-19 | 33 (2) | 10-2-17 | 41 | 10-(14-20)-23 | 99 |
| Cheat Riv, Parsons, W Va | 718 | 1913-59 | 1,656 | 1,199 | 52,100 | 10-15-54 | 9 (2) | 8-12-30 | 11.1 | 10-(9-15)-30 | 33 |
| Cheat Riv, Rowlesburg, W Va | 972 | 1923-59 | 2,222 | 1,609 | 66,300 | 10-16-54 | 10 (2) | 10-15-30 |  |  |  |
| Cheat Riv, Pisgah, W Va | 1,354 | 1927-58 | 2,988 | 2,163 | 127,000 | 10-16-54 | 13 (2) | 10-15-53 | 14 | 10-(12-18)-53 |  |
| Monongahela Riv, Greensboro, Pa | 4,407 | 1938-59 | 8,168 | 5,913 | 140,000 | 10-16-54 | 204 (5) | 9-(1-3,5)-46 | 267 | 11-(4-10)-53 | 384 |
| Youghiogheny Riv, Youghiogheny Riv Dam, Pa | 463 | 1939-59 | 850 | 615 | 13,700 | 3-5-48 | (No Flow) | (5,6)-50 |  | 5-(22-29)-50 |  |
| Youghiogheny Riv, Connellsville, Pa | 1,326 | 1908-59 | 2,503 | 1,312 | 103,000 | 10-16-54 | 11 (2) | 9-(23,26,27)-08 | 13.6 | 10-(22-28)-08 | 75 |
| Redstone Cr, Waltersburg, Pa (13) | 73.7 | 1942-63 | 99.9 | 72.3 | 4,400 | 10-15-54 | 4.2 | 8-2-62 | 12.3 | 1953 | 13 |
| Big Piney Run, Salisbury, Pa (13) | 24.5 | 1932-65 | 37.9 | 28.4 | 6,850 | 10-15-54 | 0.08 | 9-1-53 | 1.0 | 1957 |  |

Table 7 (cont.)

FLOW OF SELECTED STREAMS -- MONONGAHELA RIVER BASIN

| Stream & Station | Drainage Area (Sq Mi) | Period of Record | Average Discharge for Period of Record (cfs) | Average Discharge for Period of Record (1000 AF/Yr) | Instantaneous Maximum Discharge (cfs) | Instantaneous Maximum Discharge Date | Instantaneous Minimum Discharge (cfs) | Instantaneous Minimum Discharge Date | Consecutive 7 Day Minimum Discharge (cfs) | Consecutive 7 Day Minimum Discharge Period | Select 7 Day 10 Year Low Flows (cfs)(12) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Greenlick Run, Greenlick Res, Pa (13) | 3.0 | 1941-63 | 5.4 | 3.9 | 1,400 | 8-13-43 | 0.04 | 10-3-57 | 0.07 | 1957 | 0.07 |
| Elk Cr, Mouth (13) | 64.6 | | 124 | 89.7 | | | 0.2 | 9-14-52 | | | |
| Blackwater Riv, Mouth (13) | 86.2 | | 193 | 139.7 | 7,170 | 3-29-24 | 1.5 | 9-(11,12)-59 | | | |
| Youghiogheny Riv, Friendsville, Md | 295 | 1934-59 | 647 | 468 | 13,000 | 10-16-54 | 10 (2) | 9-8-57 | | | 54.5 |

part of the Cheat River basin range up to as much as 0.2 cfs per square mile.

The West Fork River has an extremely variable flow because its drainage area is underlain predominantly by rocks of relatively low transmissibility. The low flow of the upper West Fork River and its tributaries that are underlain by coal-bearing shale and thin beds of sandstone ranges from nearly zero to almost 0.02 cfs per square mile near Enterprise, Harrison County, W. Va. (Table 8).

Some problems of water supply shortage occur especially in the western part of the basin where communities depend on relatively small streams.

## Groundwater

Rocks of the Monongahela River basin form a series of complicated aquifer systems, often composed of several hydraulically connected water-bearing beds.

Groundwater has been developed mostly in the consolidated rocks with massive conglomerates and poorly cemented highly fractured coarse-grained sandstones being the best sources. Those areas most favorable for development of large supplies are underlain by rocks of the Allegheny and Pottsville Groups of Pennsylvanian age and the Greenbrier Limestone and the Pocono Formation of Mississippian age (Figure 3).

Unconsolidated alluvium is present along most of the Monongahela River and its major tributaries and has been developed

## Table 8

## LOW FLOW DISCHARGE FREQUENCY
## AT SELECTED GAGING STATIONS -- MONONGAHELA RIVER BASIN

| Stream & Station | Drainage Area (Sq Mi) | 7 Day - 10 Year Low Flow<br>Period of Record | (cfs) | (csm) | 1 Day - 30 Year Low Flow<br>Period of Record | (cfs) | 1 Day - 50 Year Low Flo<br>Period of Record | (cfs) |
|---|---|---|---|---|---|---|---|---|
| Tygart Valley Riv, Belington, W Va | 408 | 1908-60 | 4.2 | .0102 | | 1.4 | | 1.1 |
| Tygart Valley Riv, Philippi, W Va | 916 | 1940-60 | 8 | .0087 | 1940-60 | 2.7 | 1940-60 | 2 |
| Tygart Valley Riv, Colfax, W Va | 1,366 | 1940-59 | 192 | .1407 | | 125 | | 114 |
| West Fork Riv, Butcherville, W Va | 181 | 1916-24;<br>1926-60 | 0.2 | .0011 | | | | |
| West Fork Riv, Clarksburg, W Va (2) | 384 | 1923-59 | 2.3 | .0059 | | | | |
| West Fork Riv, Enterprise, W Va | 759 | 1908-15;<br>1933-60 | 11 | .0146 | | 4.9 | | 4 |
| Monongahela Riv, Lock 15, Hoult, W Va | 2,388 | 1916-25;<br>1939-60 | 99 | .0414 | | 46 | | 37.6 |
| Cheat Riv, nr Parsons, W Va | 718 | 1913-60 | 33 | .0459 | | 17 | | 14.2 |
| Monongahela Riv, Greenboro, Pa | 4,407 | 1939-59 | 384 | .0872 | | 208 | | 187.1 |
| Youghiogheny Riv, Connellsville, Pa (4) | 1,326 | 1908-59 | 75 | .0565 | 1908-59 | 27 | 1908-59 | 21 |
| Tygart Valley Riv, Grafton, W Va (3) | 1,184 | 1938-59 | 170 | .1144 | | | | |
| Youghiogheny Riv, Friendsville, Md | 295 | 1941-60 | 54.5 | .1848 | 1941-60 | | | |

as a good source of groundwater in the lower or northern part of the basin in Pennsylvania.

The higher yields of as much as 300 gpm are obtained from the thicker sand and gravel aquifers along the flood plains of the Monongahela River from Brownsville, Pa., to Pittsburgh, Pa., and along the floodplains of the Youghiogheny River from West Newton, Pa., to McKeesport, Pa. Induced infiltration of the river into the aquifers tends to sustain the high yields of some well fields located near the streams.

The groundwater from consolidated aquifers is satisfactory for most commercial and domestic uses; however, in some places the iron content is high enough to require removal or the water may contain sufficient hardness to require softening. In the western part of the basin, brackish groundwater is encountered beneath the near-surface fresh groundwater. In that part of the basin west of a line from Connellsville, Pa., through Uniontown, Pa., Morgantown, W. Va., and Buckhannon, W. Va., brackish groundwater occurs at depths greater than 300 feet below the major stream channels.

Groundwater from well fields developed in unconsolidated aquifers along the Monongahela and Youghiogheny rivers is of variable chemical quality which often depends on the quality of the adjacent stream, since the groundwater may be polluted by the induced infiltration of contaminated river water. Pollution may also result from industrial activities and from the infiltration of recharge through refuse filled valleys located over the developed aquifers.

Mining of coal and other rock materials affects the groundwater hydrology, and in some places the natural subsurface drainage has been radically changed. Most of the mining has been in the northwest half of the basin, and rocks of the Monongahela Group have undergone the most hydrologic changes. Deep mining has partly drained the water-bearing rocks in some areas of Marion, Monongalia, and Preston counties, W. Va. The largest changes in groundwater drainage caused by coal mining occurs after the coal pillars are mined and the rock overburden fractures as it settles. This increase in secondary permeability by fracturing allows groundwater and surface water to infiltrate the mined areas.

## GEOLOGY

The sedimentary rocks of Paleozoic age of the Monongahela River basin indicate a long and intricate history of development and change. Either concurrent with or after their deposition, the rocks were subjected to subsidence, compaction, intergranular cementation, uplifting, folding, fracturing, weathering, and dissolution by groundwater. Marine depositional environments were more prevalent when the older and more deeply buried rocks were formed. With interim periods of transgression of the seas, a continental environment of deposition developed in the later stages, and freshwater deltaic rocks predominate at shallower depths. Because of extensive folding and deep erosion in the eastern part of the basin, some of the older rocks are exposed but otherwise the older rock systems are buried at great depth.

The principal rock structures are oriented generally northeast and are most dominant in the eastern mountainous part of the basin (Figure 4). Geologic formations are exposed in roughly parallel bands and patterns. Erosion of the large anticlinal structures has exposed much older rocks in the eastern portion of the basin than in the western plateau areas where the strata are flat-lying.

The eastern part of the basin is underlain principally by about 6,000 feet of the Upper Devonian System (Figure 5). These are the oldest rocks that form the land surface in the basin and they crop out in linear patterns along the axes of major anticlines in the Tygart Valley River, Shavers Fork, and Cheat River areas. The principal lithologic types are dark-brown fissile shale, interbedded, greenish-gray, hard, flaggy, fine-grained sandstone, and sandy shale. Below these rocks lie the rocks of the Middle and Lower Devonian System composed principally of about 1,300 feet of limestone, shale, sandstone, and chert, none of which crop out in the basin.

Beneath the Devonian System, some 10,000 to 19,000 feet of sedimentary strata extend downward to the crystalline basement rocks of Precambrian age. These sedimentary rocks, in order of increasing age, belong to the Silurian, Ordovician, and Cambrian Systems. No mineral resources have been developed in these deeply buried strata in the basin. However, the rocks have been penetrated by exploratory gas wells.

Rocks of the Mississippian System overlie the Devonian System and, in the eastern part of the basin, are exposed as narrow linear patterns along the flanks of the major anticlines. The formations consist of alternating beds of gray crossbedded conglomeratic sandstone, gray and brown shale, massive limestone, sandy or shaly limestone, red and green calcareous shale and are about 1,100 feet thick. The massive pure limestone beds are of good commercial value and have been mined in several places.

From the central part of the basin to the western edge, rocks of the Appalachian Plateau have slight flexures, but there is a general regional dip toward the northwest. Increasingly younger rock groups of alternating sandstone, shale, coal, clay, and limestone are exposed to form the land surface. These rocks, from oldest to youngest, are the Pottsville, Allegheny, Conemaugh, and Monongahela Groups of Pennsylvanian age and the Dunkard Group of Permian age. The principal coal mining and oil and gas development has been in the rocks of Pennsylvanian age (Figure 3).

The Pottsville Group, exposed in much of the eastern part of the basin, is the basal group of the coal measures and of the

Pennsylvanian System. The rocks range in thickness from 65 to 1,150 feet and are mainly gray and brown coarse-grained locally crossbedded sandstone and conglomerate. Minor beds of sandy shale, siltstone, irregular and discontinuous thin beds of coal, fire clay, and limestone are present.

The Allegheny Group, overlying the Pottsville Group, ranges from 150 to 370 feet in thickness and consists predominantly of gray and brown, moderately to poorly cemented coarse-grained sandstone. Other rocks are shale, discontinuous beds of marine limestone and the economically important Freeport and Kittanning coals. Some underclays, such as the Lower Kittanning and Clarion, have been mined.

The Conemaugh Group, which is relatively flat-lying, makes up most of the land surface in the central part of the basin. These rocks, which overlie the Allegheny Group, crop out as broad irregular patterns which trend generally northeastward. The Conemaugh ranges in thickness from 70 to 840 feet and is composed of lenticular gray and brown sandstone interbedded with siltstone, gray and red sandy shale, thick beds of red shale, thin beds of impure freshwater and marine limestone, thin locally discontinuous beds of coal, and underclay. The lower 200 feet of the Conemaugh is predominantly massive basal sandstone.

The Monongahela Group, the youngest rocks of Pennsylvanian age, crops out in the western and northcentral parts of the basin in irregular belts that occupy stream valleys and form hills. The Monongahela Group is as thick as 485 feet. The group is composed predominantely of red and vari-colored sandy shale and gray calcareous shale. Also present are brown and gray sandstone, freshwater limestone, and economically important coal beds, the most developed of which are the Pittsburgh, the Redstone, the Waynesburg, and the Sewickley.

The Dunkard Group of Permian age forms the land surface in a broad area along the northwest edge of the basin. These are the youngest consolidated rocks in the basin and are as much as 1,200 feet thick in places. The group is comprised predominantly of interstratified red and brown shale, limey or sandy shale, brown and green sandstone, freshwater limestone, black carbonaceous shale, and coal. Several coal beds in the lower part are of commercial value locally. The Waynesburg sandstone, near the base, crops out over large areas and influences the local topography.

Although no part of the Monongahela River basin has been glaciated, the downstream reaches of the Monongahela and its major tributaries have unconsolidated glacial outwash alluvium as valley fill and floodplains.

Unconsolidated alluvial deposits of Pleistocene and recent ages are present along the major streams and their principal tributaries. The deposits are 30 to 40 feet thick along the floodplains of the Monongahela River from Fairmont to Morgantown, W. Va., and about 40 to 65 feet thick from Point Marion to Pittsburgh, Pa. The deposits consist of clay, silt, sand, and gravel. Most of the coarser materials occur near the bottom of the deposits.

Remnants of ancient lake terrace alluvium are present on hills near Morgantown, W. Va., 200 feet higher than the valley-fill alluvium. These lake deposits consist of lenticular deposits of gravel, sand, silt and clay and reach a maximum thickness of 85 feet.

## COAL DEPOSITS

Coals are most abundant in the western part of the basin, where they have been preserved from erosion (Figure 5). The coals have been eroded away from the crests of the major anticlines that warp the strata in the eastern part of the basin. Regionally, the coal beds dip toward the west, and the coals present in the east are increasingly present but much deeper westward. A somewhat similar relationship occurs as the coal beds dip from south to north, but the lack of continuity of the coals modifies this condition locally. More than a hundred individual coals have been named and described in the geologic reports of the basin but the majority of the seams are not of minable thickness or quality.

Coal is the chief mineral resource of the basin because many beds of commercial value crop out and are shallow enough to be mined. The most important seam commercially is the Pittsburgh coal, which is purported to be one of the most valuable mineral deposits in the world. Other important coals that are presently developed on a large scale are the Redstone, the Sewickley, the Upper and Lower Freeport, the Upper and Lower Kittanning, the Bakerstown, Waynesburg, and the Sewell. Other minable coals developed and in reserve on a much lesser scale are the Elk Lick, Harlem, Quakerstown, Peerless, Eagle, Gilbert, Hughes, Ferry, Mahoning, Brush Creek, Fire Creek, and Brookville seams (Figure 3).

Coal reserves in beds minable by present methods are present in 17 of the 18 counties in the Monongahela River basin.

The reserves have been estimated to be about 23 billion tons. Coal has been mined in all 17 counties, and the important coals in the counties are as follows:

Allegheny County, Pennsylvania

- Pittsburgh Coal
- Freeport Coal
- Redstone Coal

Westmoreland County, Pennsylvania

- Freeport Coal
- Redstone Coal
- Pittsburgh Coal
- Upper and Lower Freeport Coals
- Bakerstown Coal

Somerset County, Pennsylvania

- Upper and Lower Kittanning Coals
- Upper and Lower Freeport Coals
- Pittsburgh Coal
- Brookville
- Sewickley

Greene County, Pennsylvania

Pittsburgh Coal
Waynesburg Coal
Sewickley Coal

Fayette County, Pennsylvania

Pittsburgh Coal
Sewickley Coal
Lower Kittanning Coal
Upper Freeport Coal

Washington County, Pennsylvania

Pittsburgh Coal
Redstone Coal

Marion County, West Virginia

Pittsburgh Coal
Sewickley Coal
Waynesburg Coal

Monongalia County, West Virginia

Pittsburgh Coal
Sewickley Coal
Redstone Coal
Freeport Coal

Harrison County, West Virginia

Pittsburgh Coal
Redstone Coal

Preston County, West Virginia

Upper Freeport Coal
Bakerstown Coal
Pittsburgh Coal

Tucker County, West Virginia

Sewell Coal
Upper Freeport Coal

the outcrop and coked in beehive ovens for sale at Cincinnati beginning in the 1850's. The earliest mines were of the drift type; only much later was mining done on a large scale by slope, shaft, and stripping methods.

Mining operations in the basin before 1800 were not large. Coal was dug by hand, and, in general, the effects were small. However, as the operations became larger with the introduction of new machinery and changes in the market, the effects upon the land and water increased. Most of the past mining operations have left openings, subsided areas, coal refuse piles, and acid mine water discharges.

Coal has been mined in 17 counties of the basin; in 1965 the production from about 750 mines was approximately 65 million tons. The principal coal-producing counties are Marion, Monongalia, Harrison, Preston, and Barbour in West Virginia, and Green, Washington, Westmoreland, Fayette, Somerset, and Allegheny in Pennsylvania.

Several methods have been utilized to mine coal beds of the basin, but all of the various methods are in the two general categories of either underground or surface operations. Characteristics of the coal such as thickness, depth, dip, extent, character and thickness of the roof and mine floor, and other factors serve to determine the type of entry and mining method.

Where the coal bed crops out at the land surface or lies at depths of less than a few hundred feet, a drift or slope entry is most often used for underground mining. A drift entry that starts at the coal outcrop enables coal to be produced immediately. A slope entry is an inclined tunnel to the coal bed. Mining of the coal starts from the end of the slope. Where the coal bed occurs at greater depths, a vertical shaft entry is used. At the base of the shaft, the mining proceeds laterally into the coal. Usually two or more headings are constructed to develop the working face area. From these main headings lateral mining is done by either room and pillar or long wall methods.

Special large openings to the land surface may be constructed as additional manways for miners and for ventilation equipment such as air ducts and fans. Other openings, such as boreholes, may be constructed for electric power cables, communications, water lines, or pumping equipment.

In room and pillar mining, mines are usually divided into large sections or panels. Work can then be concentrated in certain panels for safety purposes. Two or more entries are driven to develop a panel, one entry for haulage and bringing in fresh air and the other for return air. Cross-cuts and rooms are driven through the panel of coal to divide it into pillars. Rooms and cross-cuts are usually 12 to 30 feet wide and pillars are 20 to 60 feet wide and 60 to 100 feet long.

In room and pillar mining, 25 to 30 percent of the coal is extracted during the development of the rooms and pillars, thus leaving 70 to 75 percent of the coal to be mined by extraction of the pillars. Up to 90 percent of the coal can be eventually extracted in favorable circumstances, but recovery is often as low as 50 percent.

Long wall mining has main headings so constructed that a long working face is mined by the cutting action of a plow or shearer combination cutting and loading machine. The mining is continuous back and forth across the face.

Water that enters the underground working areas must usually be removed. It is sometimes stored in low unused areas in the mine and then drained or pumped to the surface. Modern mining techniques are directed toward preventing water from entering the mine and rapidly removing the water that does enter. Pollution is controlled in some mines by limiting the amount of acid producing material the water may contact and by shortening the contact line.

Surface or strip mining methods are practical in areas where the rock and soil overburden is relatively thin. The thickness of overburden for economical removal depends not only on the value and character of the coal reserves but also on the type of mining machinery that can be used. The first operational step is the removal of trees and other vegetation and soil cover. The rock overburden is then removed, and the first large strip trench formed is used to deposit overburden from the adjacent trench. Consequently, in areas where the coal is flat lying and the land surface has low relief, strip mining disturbs large areas or blocks of land.

Where the coal bed crops out on a hillside, the overburden thickens rapidly toward the center of the hill. In these places the stripping method is limited to the mining of a band at the outcrop around the hill. In order to remove additional coal from inside the hill, large augers are often used to remove the coal up to 200 feet back from the surface. The broken coal is brought outward to the surface by the auger.

During surface mining, the water is diverted away from the excavation trench to avoid excessively wet conditions. Groundwater may enter the trench in places, especially where old abandoned underground workings are intercepted, and large volumes of stored mine water may have to be controlled. Upon completion of the coal removal, state regulations specify the method by which the mined area is to be reclaimed.

Most all methods of mining and coal processing operations result in some problem of rock and refuse disposal. The waste may be piled in the general vicinity of the mine and preparation plant, in selected adjacent areas or in abandoned areas inside the mine. Final disposal of this waste material presents considerable problems in some areas where there is little flat land available.

## STREAM QUALITY AS AFFECTED BY MINE DRAINAGE

### THE WATER QUALITY PROBLEM

The Monongahela River is more intensely polluted by coal mine drainage than any major stream in the United States. More than 2400 miles of streams in the basin were affected by mine drainage during the inventory (Fig. 2). Only the areas of the basin that do not have minable coal seams are totally free from the pollutional effects of mine drainage.

Stream pollution problems within the Monongahela River basin attributable to mine drainage are: high concentrations of acidity, iron, manganese, sulfate, and hardness; low pH; and turbidity and bottom deposits from chemical precipitates. Siltation caused by runoff from mining activities often causes severe local stream pollution problems. Control of this source of pollution is necessary.

The pollutants from mine drainage impair the principal water uses for: municipal, industrial, and agricultural water supplies; certain water-based recreation; support and propagation of fish and other aquatic life. They also cause corrosion of boats, barges, and instream facilities, and esthetically damage and degrade the waterfront property values.

The degradation of water quality in the Monongahela River and its tributaries has existed as long as coal has been mined in large quantities in the basin. The earliest miners recognized, at least visually, the effects of polluted mine water that came from their workings.

Although recorded evidence of the magnitude and extent of water pollution during the early years of coal mining is meager, a number of written references to the problem were made prior to 1900. Some of the earliest recorded references to the acid condition of certain streams in the Monongahela River basin were made by the communities and industries which utilized those streams for water supply. The U. S. Geological Survey, in a 1906 publication (Water Supply Paper 161), described the quality of waters used for public supply in the upper Ohio River basin and pointed out those waters that were contaminated by mine drainage. The condition of the Youghiogheny River was particularly severe in those early years. The river contained sufficient free acid at times of low flow to kill fish as early as 1890. Investigations by USPHS in 1914 showed the Monongahela River at Pittsburgh was definitely acid during the months of May to October, inclusive.

Numerous surveys, studies, and intermittent evaluations of the Monongahela water quality problem have been made since 1940. One of the principal studies made in this time period was the 1963 study that preceded establishment of the Monongahela River Mine

Drainage Remedial Project. The report of that study, "Report on Pollution of the Interstate Waters of the Monongahela River System," stated that "The major pollutional problem in the Monongahela Basin is the acid mine drainage. The acidity of the streams, resulting from acid mine drainage, has caused great damage to water uses and has served as an excuse to postpone the abatement of organic and bacterial pollution."

## STREAM SAMPLING

The field work to locate and inventory all of the mines and mine-associated sites in the basin began in January 1965 and was completed in May 1968. The inventory was accompanied by the establishment of stream sample stations throughout the study area to provide information on the effects of mine drainage on stream water quality. A total of 39 stream stations were established and sampled during the period of inventory. The stations are shown on the basin drainage map, Figure 2.

## LENGTHS OF STREAMS AFFECTED

Estimations were made of the total lengths of the streams in the basin affected by mine drainage. Mileage figures are presented in the form of sub-basin totals (Table 5). The mileage determinations are based on location of mines and field observations. The ratios of the stream miles affected by mine drainage in each sub-basin to the estimated total miles of streams are shown in the right hand column of Table 5. By this method, a factor was assigned for each study area as a basis to compare the linear magnitude of the pollution problem throughout the basin.

As indicated by the ratios, the Upper Tygart Valley River and Laurel Hill Creek areas were affected only slightly. In the Lower Cheat River, Elk Creek, Middle Monongahela River, Lower Tygart Valley River, Redstone and Dunlap creeks, and the Upper Monongahela sub-basins, 40 percent or more of the streams were affected.

## STREAMS AFFECTED AND PRESENT QUALITY

Generally, alkaline surface water within the basin occurs in small tributaries located in the northwestern and southeastern extremities of the 7,384 square mile study area. With this general exception, surface waters of the basin are acidic or marginally acidic as a result of coal mine drainage. Unfortunately, most streams in the Monongahela River basin are in contact only with sandstone, shale, and coal. Reactions with these materials result in only slightly alkaline (or buffered) water with limited neutralization capacity. Small amounts of acid drainage seriously affect these streams.

Only an 18 percent depletion of the original bituminous coal resource has resulted in the vast mine drainage pollution problem that now exists in the Monongahela River basin. Although the remaining reserves are not all presently minable, it is apparent that adequate control measures should be developed and applied to prevent further water quality degradation.

Although pollution from coal mine drainage is the major water quality problem in the basin, waste loads from industries and municipalities are also significant. The impact of these wastes, however, is often masked by the presence of large amounts of acidity in the receiving streams.

The following is a discussion of mine-drainage stream pollution conditions found during the field studies of the Monongahela River Mine Drainage Remedial Project, initiated in January 1965.

## West Fork River

The West Fork and Tygart Valley rivers meet at Fairmont, West Virginia, to form the Monongahela River. The West Fork River drains 882 square miles of West Virginia and is composed of four of the watershed units utilized in this study (Figures 1 and 2 ). The four watersheds are:

| Sub-Basin No. | Sub-Basin |
|---|---|
| 8 | Lower West Fork River |
| 9 | Tenmile Creek |
| 10 | Elk Creek |
| 11 | Upper West Fork River |

At its mouth and over most of its length, the West Fork River was highly mineralized, and a restricted habitat for aquatic life. A total of 450 miles of streams in the West Fork River basin were affected by coal mine drainage.

Of particular concern is the degraded water quality, particularly hardness, at the water supply intake for the city of Clarksburg, the largest community in the West Fork River drainage area. The following statement was included in the 1963 survey report: "The acid condition of the West Fork River has changed little since 1940. The problem of acid mine drainage in the West Fork River was recognized as early as 1930. During the years 1926 through 1929, hardness of the Clarksburg water supply averaged 53 mg/l in 1926 to 66 mg/l in 1929. In 1930 the average increased to 176 mg/l. During the 1963 survey the West Fork River at Clarksburg had an average hardness of 209 mg/l, indicating degradation since 1930. An increase in hardness increases the cost of treating water for domestic and industrial purposes." Chemical analyses performed on 33 samples collected in 1965-66 from the West Fork River at Clarksburg had an average total hardness content of 465 mg/l.

The first mine drainage entered the West Fork River near the headwaters in the vicinity of Walkerville in Lewis County. From this point downstream, mine discharges entered the main stream in increasing numbers. The first mine drainage of serious proportions entered the West Fork in the Harrison County reach of the stream. Virtually every tributary in this area discharged significant amounts of acid and highly mineralized water to the West Fork River. Isaacs Creek, Browns Creek, and Elk Creek were the principal tributaries upstream from Clarksburg, West Virginia, transporting mine drainage to the West Fork River.

In the reach from Clarksburg to Fairmont, the water quality in the West Fork River continued to deteriorate because of additional mine drainage. Numerous very low quality tributaries were located in this reach, including Simpson Creek and Tenmile Creek.

A summary of pertinent stream water quality data from key locations in the West Fork River basin is presented in Table 9. The data for Station 1307 indicate that the West Fork River at Weston was significantly affected by coal mine drainage but alternately ranged from moderately acidic to moderately alkaline. During the study the stream contained net alkalinity more than one-half of the time, and an average net alkalinity load in excess of 700 lbs/day, as reflected by the 32 samples collected at Weston. The specific conductance, iron, hardness, and sulfate values were above normal or desired levels as a result of mine drainage. The magnitude of the average sulfate concentration indicates the amount of mine drainage entering the stream.

The West Fork River at Clarksburg (Station 1306) was generally of the same acidity, alkalinity, and pH as at the Weston location. That is, during the study period the stream alternated from moderately acidic to moderately alkaline; contained net acidity 22 percent of

## TABLE 9

## STREAM WATER QUALITY DATA
## WEST FORK RIVER BASIN

| | Mon. Project Station No. | Location | Number Samples | Sampling Period | pH Range | Specific Conductance | Net Acidity[2] mg/l | Net Acidity[2] lb/day | % of Samples acid | % of Samples alk. | Total Iron mg/l | Total Iron lb/day | Total Hardness (mg/l) | Sulfate mg/l |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. | 1307 | West Fork R. @ Weston | 32 | 7/65-7/66 | 5.3-7.5 | 503(28)* | -11 | -789 | | 63 | 1.3 | 308 | 173 | 156 |
| 2. | 1306 | West Fork River at Clarksburg | 36 | 7/65-12/66 | 4.9-7.5 | 891(33) | -7 | -3023 | | 78 | .6 | 185 | 465 | 446 |
| 3. | 1303 | West Fork R. @ Enterprise | 38 | 4/65-2/67 | 2.8-6.3 | 1626(35) | 231 | 160,615 | 47 | | 10.9 | 17,938 | 649 | 893 |
| 4 | 1308 | Elk Creek at Quiet Dell | 33 | 8/65-12/66 | 2.4-6.3 | 1956(30) | 289(32) | 30,928 | 100 | | 14.2 (31) | 1669 | 791 (32) | 1188(31 |
| 5. | 1330 | Tenmile Creek at Robey | 31 | 10/65-7/67 | 2.9-6.5 | 981 | 47 | 11,773 | 67 | | 11.3 (30) | 5617 | 336 | 472(30 |
| 6. | 120[1] | Simpson Creek below Bridgeport | 9 | 7/65-5/66 | 2.8-3.1 | 2341 | 366 | 58,368 | 100 | | 23.5 | 3660 | 928 | 1364 |
| 7. | 122[1] | West Fork River below Clarksburg | 13 | 7/65-5/66 | 4.3-6.3 | 1327 | 25 | 13,031 | 85 | | 2.8 | 1054 | 631 | 686 |
| 8. | 117[1] | West Fork River near Fairmont | 12 | 7/65-5/66 | 2.9-3.5 | 1785 | 217 | 311,628 | 100 | | 8.5 | 18,744 | 783 | 1047 |

[1] Sampling stations utilized by the Ohio River Basin Comprehensive Survey, FWPCA.
[2] Negative values indicate net alkalinity.
* ( ) indicates the number of smaples used in averages when other than the maximum.

the time; and contained undesirable concentrations of hardness, iron, and sulfate. The higher concentrations of hardness and sulfate, and the high conductivity value, compared to those at Weston, indicate the quantity of acid mine drainage received by the West Fork River in the intervening reach. Despite additional acid drainage, the average net alkalinity concentration at Clarksburg was not significantly changed in comparison with the concentration at Weston, which indicates the utilization of buffering capacity between the two stations.

Downstream from Clarksburg (Station 122), the data indicate that the West Fork River was more acidic than at Station 1306. This station was located downstream from and below the zone of influence of Elk Creek, a highly acid tributary that enters the West Fork River at Clarksburg.

Elk Creek (Station 1308) was consistently acid during the two-year period of evaluation. The pH level was as low as 2.4 and an average of more than 15 tons per day of acid was discharged from Elk Creek to the West Fork. The water quality measurements at Station 1308 indicate that Elk Creek was one of the most severely degraded streams in the West Fork basin.

In the reach of the main stream between Clarksburg and Station 1303, Tenmile Creek and Simpson Creek contribute mine drainage loadings to the West Fork River (stations 1330 and 120). During the study period these tributaries contributed average net acid loads of about six and 29 tons per day, respectively, to the West Fork. Simpson Creek contained an average acidity concentration of 366 mg/l in nine samples, and a maximum acidity concentration of 418 mg/l.

The water quality of the West Fork River at Enterprise (Station 1303) reflects the addition of acid from the tributaries, Tenmile Creek, Simpson Creek, and others. Water quality of the West Fork River at Enterprise was more acidic by a factor of about 10 than upstream at Station 122 at Clarksburg. At the Enterprise location, fluctuations to the alkaline side still occurred, but fluctuations to the acidic side were much more extreme than those at Clarksburg or Weston. Acidity concentrations as high as 459 mg/l were recorded at this location during the study.

At Fairmont, West Virginia, the West Fork River joins with the Tygart Valley River to form the Monongahela River. The quality of the stream at its mouth was much lower than at Station 1303, Enterprise, West Virginia. Acidity concentrations were slightly reduced in comparison with those at Enterprise, but the hardness and sulfate concentrations increased, indicating that additional mine drainage had been received. The stream at Fairmont was acidic every time it was sampled, and had a pH range of 2.9 - 3.5. The acid load at the mouth also increased to 156 tons per day, versus 80 tons per day measured at Enterprise during the same period. The West Fork River terminates at its confluence with the Tygart Valley River as a highly acid, highly mineralized stream as a result of mine drainage pollution.

## Tygart Valley River

The Tygart Valley and West Fork rivers meet at Fairmont, West Virginia, to form the Monongahela River. The Tygart Valley River drains 1,370 square miles of West Virginia and is composed of six of the sub-basins utilized in this study. The six watersheds are:

| Sub-Basin No. | Sub-Basin Name |
|---|---|
| 12 | Lower Tygart Valley River |
| 13 | Middle Tygart Valley River |
| 14 | Buckhannon River |
| 15 | Middle Fork River |
| 16 | Upper Tygart Valley River |
| 17 | Leading Creek |

The Tygart Valley River basin had less coal mining and fewer mine drainage pollution sources than the West Fork River basin and contributed substantially less acidity to the Monongahela River. The main stream and its tributaries have a total affected length of some 368 miles. However, the severity of pollution in these streams was less than that in the 450 affected stream miles in the West Fork drainage.

The Tygart Valley River received the first mine drainage near the drainage divide west of the community of Valley Bend in Randolph County. However, this inflow was insignificant and no other discharges were encountered until a point a few miles downstream from Elkins, West Virginia. At this point, Roaring Creek enters the main stream and contributed a large, continuous acid load. Additional mine drainage entered the Tygart Valley River from this point to its mouth at Fairmount.

A summary of pertinent stream water quality information from key locations in the Tygart Valley River basin is presented in Table 10.

Station 1314, Tygart Valley River at Belington, was located several miles downstream from the Roaring Creek area mining complex but upstream from the mouth of the Middle Fork River. At this location, survey results showed the stream to be affected by acid mine drainage to the point that the pH level dropped as low as 3.9 and one-half of the samples were acidic. However, an average net alkaline load was present at this point in the Tygart Valley River on the 22 sampling occasions.

On the average, the stream at this location was of poor quality about one-half of the time. The acidic conditions occurred predominantly during periods of low stream flow.

The Middle Fork River enters the Tygart just north of the Barbour-Upshur county line. About 94 percent of the samples were acidic from the Middle Fork sampling station and indicated an average acid load of nearly three tons per day to the Tygart Valley River. The minimum pH recorded at this location was 3.9; however, the conductivity and concentrations of iron, hardness, and sulfate remained relatively low.

## Table 10

### Stream water quality
### Tygart Valley River basin

| on. Project tation No. | Location | No. Samples | Sampling Period | pH Range | Specific Conductance | Net Acidity2/ mg/l | Net Acidity2/ lb/day | % of Samples Acid | % of Samples Alkaline | Total Iron mg/l | Total Iron lb/day | Total Hardness mg/l | Sulfate mg/l |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1314 | Tygart Valley River @ Belington | 22 | 11/64-2/65 | 3.9-7.6 | 95 | -0.7(15)* | -30,407 (15) | | 53 | 0.5 | 4092 | 36 | 31 |
| 1313 | Tygart Valley River @ Grafton | 15 | 4/65-12/66 | 4.1-6.1 | 167(12) | 14 | 81,911 | 93 | | 0.3 | 2960 | 39 | 34 |
| 1309 | Buckhannon River @ Hall | 32 | 4/65-12/66 | 4.0-6.6 | 127(28) | 3 | 6,177 | 72 | | 0.6 | 685 | 37 | 25 |
| 1310 | Middle Fork River @ Audra | 32 | 4/65-12/66 | 3.9-7.0 | <50 | 11 | 5,478 | 94 | | 0.3 | 164 | 15 | 8 |
| 1331 | Sandy Creek @ Claude | 12 | 12/65-12/66 | 3.3-4.1(11) | 447 | 120 | 24,930 | 91 | | 8.7 | 948 | 224 | 132 |
| 104 1/ | Tygart Valley River @ Colfax | 10 | 7/65-5/66 | 4.7-7.5 | 103 | 26 | 76,630 | 100 | | 0.3 | 1665 | 55 | 33 |
| 105 1/ | Tygart Valley River - below Grafton | 1 | 7/65 | 7.3 | 90 | 25 | 59,800 | | | 0.2 | 478 | 52 | 16 |

1/ Sampling Stations utilized by the Ohio River Basin Comprehensive Survey, FWPCA
2/ Negative values indicate net alkalinity
( )* Indicates the number of samples used in averages when other than the maximum

The Buckhannon River enters the Tygart just downstream from the mouth of the Middle Fork River. Although samples from this station (1309) were alkaline on more occasions than they were acid, the average acid load discharged was slightly more than three tons per day. The concentration of net acidity was lower in the Buckhannon River than in the Middle Fork, but iron, hardness, and sulfate values were much higher. Levels of pH as low as 4.0 were measured at this station.

Station 1313 was located downstream from Tygart Lake and upstream from Grafton, West Virginia, in Taylor County. The water quality had become considerably more acidic at this point than at Belington. Although the average net acidity concentration was only 14 mg/1, the average daily acid load, indicated by the samples, was over 40 tons per day. Acid stream conditions existed 93 percent of the time. Concentrations of related criteria at this station were similar to those at the Belington station. The river was, however, in an acidic state considerably more of the time at Station 1313 than at Belington.

Sandy Creek was the single largest contributor to the 40-ton per day acid load measured downstream from Tygart Lake at Station 1313; the creek discharges into Tygart Lake from the east. An average load of about 12 tons per day of acid was measured at Station 1331 on Sandy Creek. This tributary was seriously polluted by mine drainage and contained excessive concentrations of acidity and related constituents. The average net acidity concentration of 120 mg/l in Sandy Creek at Claude, West Virginia, was the highest such stream value encountered in the Tygart Valley River basin.

At Colfax, West Virginia, the station nearest the stream mouth, the Tygart Valley River consistently carried a net acid load, which was discharged to the Monongahela River. Some 38 tons per day of acid were carried by the stream at this station. This value, plus the 156 tons per day from the West Fork River, contributed nearly 200 tons per day net acid load to the Monongahela River.

## Cheat River

The Cheat River enters the Monongahela River near the West Virginia-Pennsylvania state line at Pt. Marion, Pennsylvania. The Cheat River drains 1422 square miles of eastern West Virginia and southern Pennsylvania. The area is composed of five of the subbasins of this study (Figures 1 and 2). The five watersheds are:

| Sub-Basin No. | Sub-Basin Name |
|---|---|
| 18 | Lower Cheat River |
| 19 | Big Sandy River |
| 20 | Upper Cheat River |
| 21 | Shavers Fork |
| 22 | Blackwater River Area |

Water quality in streams in the Cheat River basin is seriously degraded by mine drainage. A large, privately owned impoundment (Lake Lynn) and a prime recreation area (Blackwater River area) are damaged and threatened with further deterioration from mine drainage. The same quality problems will affect an authorized, multi-purpose, public impoundment (Rowlesburg Reservoir). Acid discharges from the Cheat River to the Monongahela River increase the load in the larger stream. A total of 328 miles of streams in the Cheat River basin were affected by drainage from coal mines.

Dry Fork and the Blackwater River merge at the community of Hendricks, West Virginia, to form the Black Fork. The Black Fork and Shavers Fork meet a few miles downstream at Parsons to form the Cheat River. The Dry Fork drainage area was almost free of coal mining and the attendant deleterious drainage. The first significant drainage from coal mines in the Cheat River emanated from the Blackwater River drainage area in Tucker County. Portions of this presently important and potentially more important recreation area were seriously polluted by mine drainage.

The principal areas with mine drainage in the Blackwater River were in the watersheds of Beaver Creek, Pendleton Creek, and North Fork. Beaver Creek and North Fork were particularly high acid contributing tributaries to the main stream. The Beaver Creek valley had been strip-mined for nearly its entire length and the North Fork carried the drainage from several high-volume-of-flow underground mines. One opening to an underground mine discharged an acid load of about 3,000 lbs/day to the North Fork during the field inventory.

In the reach of the Cheat River from Parsons, West Virginia, to its mouth at Pt. Marion, Pennsylvania, there were several areas with large amounts of mine drainage. Among the principal acid-producing areas were the watersheds of several small tributaries in the vicinity of Kingwood, West Virginia, Muddy Creek in central Preston County, Big Sandy Creek in the northeastern corner of the Cheat River basin, and the small drainage area along and immediately downstream from Lake Lynn.

A summary of pertinent stream water quality information from key locations in the Cheat River basin is shown in Table 11.

During the study period Shavers Fork discharged an average acid load of about 18,000 lbs/day, as measured at Station 1321. Upstream at Cheat Bridge, Station 1320, the stream carried a slightly higher load of about 20,000 lbs/day. Acidity concentrations at both locations, however, were consistently low, generally less than 20 mg/1. Available stream water quality and mine drainage inventory data suggest that the frequently recurring low pH in Shavers Fork is partly attributable to naturally occurring acids from forested areas. This is verified by the low concentrations of sulfates and hardness.

## Table 11

Stream water quality data
Cheat River basin

| | Mon. Project Station No. | Location | No. Samples | Sampling Period | pH Range | Specific Conductance | Net Acidity[2] mg/l | Net Acidity[2] lb/day | % of Samples Acid | % of Samples Alkaline | Total Iron mg/l | Total Iron lb/day | Total Hardness mg/l | Sulfate mg/l |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1317 | Cheat River @ Parsons | 30 | 4/65-7/67 | 4.9-7.4 | 96(25)* | -6 | 21,364 | | 60 | 0.5 | 3031 | 45 | 17 |
| 2 | 95[1] | Cheat River @ Rowlesburg | 6 | 7/65-5/66 | 6.8-7.6 | 70 | 9 | 29,260 | 83 | | 0.2 | 873 | 46 | 10(3) |
| 3 | 94[1] | Cheat River @ Albright | 12 | 7/65-5/66 | 3.4-6.2 | 178 | 33 | 41,214 | 100 | | 1.1 | 4381 | 72 | 54 |
| 4 | 1327 | Cheat River below Lake Lynn | 11 | 8/65-11/66 | 3.2-6.7 | 244 | 56 | [3] | 91 | | 2.5 | [3] | 54 | 56 |
| 5 | 1320 | Shavers Fork @ Cheat Bridge | 22 | 8/65-7/67 | 4.3-6.9 | 450 | 14 | 19,945 | 50 | | 0.3 | 218 | 25 | 7 |
| 6 | 1315 | Dry Fork River @ Hendricks | 22 | 4/65-12/66 | 6.3-7.8 | 102(18) | -15 | -20,575 | | 91 | 0.1 | 350 | 42 | 7 |
| 7 | 1316 | Blackwater River @ Hendricks | 17 | 4/65-12/66 | 3.4-5.3 | 186 | 38 | 34,890 | 100 | | 1.9(16) | 2176(16) | 62(16) | 67(16) |
| 8 | 1321 | Shavers Fork @ Parsons | 26 | 4/65-7/67 | 5.3-6.7 | 60(21) | 3 | 18,418 | | 59 | 0.4 | 5591 | 23 | 9 |
| 9 | 1318 | Muddy Creek @ Ruthbell | 16 | 4/65-9/67 | 2.6-4.0 | 874 | 233 | 25,857(14) | 100 | | 22.3 | 2059(14) | 258 | 360 |
| 10 | 1319 | Big Sandy Creek @ Rockville | 14 | 4/65-12/65 | 4.0-7.2 | 126(12) | 0.7 | 5588 | 71 | | 0.3 | 291 | 49 | 29 |

[1] Sampling stations utilized by the Ohio River Basin Comprehensive Survey, FWPCA

[2] Negative values indicate net alkalinity

( )* Indicates the number of samples used in averages when other than the maximum

[3] Flow values for instantaneous discharge are not representative because of releases to generate power during periods of high demands. Mean daily flows are not available.

At its mouth, the Blackwater River discharged an average acid load in excess of 17 tons per day to the Black Fork. During the study period the highest pH recorded at this location was 5.3, but the values were usually less than 4.3. Data in Table 10 show that the water at Station 1316 was acidic 100 percent of the time, with an average net acidity concentration of 38 mg/l. The maximum acidity concentration was 91 mg/l, and the alkalinity was totally depleted on all but one occasion. Dry Fork, tributary to Black Fork at Hendricks (Station 1315), was an alkaline, good quality stream during the study period.

The Cheat River at Parsons, Station 1317, was acidic 40 percent of the study period. Levels of pH dropped to as low as 4.9, but fluctuated over a wide range, as did the net acidity concentrations. Slightly more than 10 tons per day net acid load was carried by the stream at this location. On the average, the main stream at Parsons was slightly acidic with low concentrations of iron, hardness, and sulfate. Water quality data for this location approximate the quality to be expected by the mixing of waters of the quality indicated for stations 1321, 1315, and 1316 (Shavers Fork, Dry Fork, and Blackwater River, respectively).

Downstream from the Preston-Tucker county line at Rowlesburg, West Virginia, limited data for Station 95 indicate the water quality of the stream was generally consistent with that at the Parsons location. Acid conditions were not reflected, however, by depressed pH levels at the Rowlesburg location.

In the area of the Cheat River just upstream from Kingwood, a number of acid-affected tributaries enter the main stream and markedly deteriorate its water quality. These tributaries are Pringle Run, Lick Run, Heather Run, and Morgan Run. The four streams drain an extensively mined area south of Kingwood, West Virginia. The effect of this drainage was indicated by the data from the sampling station on the Cheat River at Albright (No. 94).

Twelve samples from Station 94 indicated a pH range of 3.4 - 6.2 and an average net acidity concentration of 33 mg/l, compared to a value of 9 mg/l at Rowlesburg. The average net acid load was nearly 21 tons per day and the stream was acidic each of the 12 times it was sampled.

Muddy Creek enters the Cheat River just downstream from the community of Albright and contributed a very large acid load to the main stream. It was the most acid stream sampled in the Cheat River basin, with an average of 233 mg/l of acidity and an average acid load of over 25,000 lbs/day. The maximum pH in this stream was 4.0 and all water quality parameters had high concentrations. Most of the Muddy Creek drainage area had been mined by both surface and underground operations.

Big Sandy Creek enters the Cheat River near the Monongalia-Preston county line. This drainage area had been extensively mined also and contributed low quality water to the main stream. However, Big Sandy Creek was not as degraded as Muddy Creek described above.

During the survey, Big Sandy Creek at Rockville, West Virginia, (Station 1319) discharged an average acid load of about three tons per day, was acidic 71 percent of the time, and had pH values as low as 4.0. Fluctuations to the alkaline side were frequent, however, and the alkaline fraction was totally depleted on only one occasion.

Station 1327, on the Cheat River below Lake Lynn (Cheat Lake), is representative of the water quality entering the Monongahela River at Pt. Marion, Pennsylvania. The stream was occasionally alkaline but fluctuated predominately to the acidic side with pH levels as low as 3.2.

## Youghiogheny River

The Youghiogheny River enters the Monongahela River at McKeesport, Pennsylvania. It is the largest tributary to the main stream and drains 1940 square miles in Pennsylvania, Maryland, and a small corner of eastern West Virginia. The Youghiogheny River is comprised of eight of the sub-basin units included in this study (Figures 1 and 2). The eight sub-basins are:

| Sub-Basin No. | Sub-Basin Name |
|---|---|
| 23 | Lower Youghiogheny River |
| 24 | Sewickley Creek |
| 25 | Middle Youghiogheny River |
| 26 | Mounts and Indian Creeks |
| 27 | Youghiogheny River West |
| 28 | Laurel Hill Creek |
| 29 | Casselman River |
| 30 | Upper Youghiogheny River |

The history of water quality in the Youghiogheny River is somewhat different from that of the other major Monongahela tributaries. It differs in that the stream quality has improved significantly with respect to mine drainage and related constituents, in comparison with the quality in the early part of the period of record. It was found during the 1963 survey that "The Youghiogheny River in some sections has shown improvement in acid conditions from 1940 to 1963. The particular section studied that indicated improvement in acid loads from 1940 to 1963 extends from Oakland, Maryland, to Confluence, Pennsylvania. The pH values increased, and the section has changed from an acid to an alkaline stream."

A total of 462 miles of streams in the Youghiogheny River basin was affected by coal mine drainage.

The Youghiogheny River was damaged by acid mine drainage almost to its beginning in eastern Preston County, West Virginia. The Snowy Creek and Laurel Run areas just west of Crellin, Maryland, contained numerous mine drainage sources and a sizeable acid load was discharged to the Youghiogheny River at Crellin.

Only occasional mine discharges were located downstream from the Crellin area to the confluence of the main stream with the Casselman River at Confluence, Pennsylvania. The Casselman River was degraded seriously by mine drainage and contributed a large acid load to the Youghiogheny River. Downstream from Confluence, Pennsylvania, Indian, Sewickley, and Turtle creeks were principal acid-carrying tributaries that contributed poor quality water to the main stream. Sewickley Creek was the most degraded of these tributaries.

A summary of pertinent stream water quality information from key locations in the Youghiogheny River basin is presented in Table 12.

The Youghiogheny River at Friendsville, Maryland, was an acid stream during the majority of the study period (18 samples, Station 51, 4/65-12/66). The acidity measured at this location was primarily residual from the Crellin, Maryland, area mining complex drained by Snowy Creek and Laurel Run. Nine tons per day acidity were carried by the stream at Station 51, and acidic conditions prevailed about three-fourths of the time. The degree of acid conditions, however, was slight as the average net acidity concentration was only 5 mg/l.

At Confluence, Pennsylvania, downstream from the Youghiogheny River reservoir and upstream from the juncture with the Casselman River, Station 1360 was sampled on 30 occasions during the study period. The data indicate that the water quality at this location was generally the same as that at the Friendsville location. Based on these data, insufficient acid was received in the intervening stream reach to further deteriorate water quality, and also insufficient alkalinity was received to neutralize the in-stream acidity. The effects of impoundment in the Youghiogheny reservoir on water quality were not considered in this study.

The Casselman River drains an area east of Confluence, Pennsylvania. This area had been mined extensively for coal; consequently, water quality problems from mine drainage were extensive in this major

### Table 12

Stream water quality data
Youghiogheny River basin

| | Mon. Project Station No. | Location | No. Samples | Sampling Period | pH Range | Specific Conductance | Net Acidity mg/1 | Net Acidity lb/day | % of Samples Acid | % of Samples Alkaline | Total Iron mg/1 | Total Iron lb/day | Total Hardness mg/1 | Sulfate mg/1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 51 | Youghiogheny River @ Friendsville, Maryland | 18 | 4/65-12/66 | 4.9-6.4(10)* | 85(15) | 5 | 18,078 | 72 | | 0.8 | 2328 | 29 | 14 |
| 2 | 1360 | Youghiogheny River @ Confluence, Pa. | 30 | 4/65-12/66 | 4.3-6.6(20) | 64(26) | 5 | 15,256 | 60 | | 0.4 | 1985 | 36 | 11 |
| 3 | 410 1/ | Youghiogheny River below Connelleville, Pa. | 10 | 9/65-4/66 | 5.5-6.8 | 155 | 14 | 125,773 | 90 | | 1.4 | 23,789 | 77(9) | 44 |
| 4 | 1351 | Youghiogheny River @ Sutersville, Pa | 23 | 4/65-12/67 | 3.8-6.8(16) | 298(20) | 16 | 120,083 | 87 | | 4.0 | 34,173 | 177 | 142 |
| 5 | 1361 | Casselman River @ Markleton, Pa. | 30 | 4/65-12/67 | 3.1-6.2(21) | 419(26) | 56 | 56,534 | 100 | | 1.0 | 3,510 | 181 | 166 |
| 6 | 417 1/ | Casselman River below Whites Creek | 10 | 9/65-4/66 | 4.5-6.0 | 367 | 41 | 60,263 | 100 | | 0.9 | 5167 | 162 | 131 |
| 7 | 1362 | Laurel Hill Creek @ Ursina, Pa. | 17 | 4/65-7/67 | 5.3-6.5(10) | 74(14) | -31 | -8181 | | 65 | 0.1 | 166 | 45 | 10 |
| 8 | 1370 | Indian Creek near mouth | 12 | 5/66-7/67 | 2.9-5.9 | 494 | 82 | 18,133 | 100 | | 7.1 | 2385 | 118 | 126 |
| 9 | 1364 | Jacobs Creek near mouth | 15 | 4/65-12/67 | 4.6-7.1 | 350(16) | -3 | -2903 | | 73 | 0.9 | 299 | 181 | 115 |
| 10 | 1350 | Sewickley Creek @ Lowber, Pa. | 30 | 3/65-3/66 | 3.3-60 | 1968 | 260 | 65,267 | 100 | | 44.7 | 11,764 | 623 | 1103 |

1/ Sampling stations utilized by the Ohio River Basin Comprehensive Survey, FWPCA.
2/ Negative values indicate net alkalinity.
( )* Indicates the number of samples used in averages when other than the maximum.

tributary to the Youghiogheny River. The Casselman River at Markleton, Pennsylvania, transported a daily net acid load of 28 tons and was consistently an acid stream during the study period. Objectionable concentrations of iron, hardness, and sulfate also characterized the water quality at this sampling station (Station 1361).

Data from analyses of samples from Station 417, on the Casselman River downstream from White's Creek, indicated that the conditions were comparable to those at Station 1361. Laurel Hill Creek enters the main stream just downstream from Confluence, Pennsylvania, and drains an area that was lightly mined adjacent to the Casselman River area. Data from analyses of samples from Station 1362 at Ursina, Pennsylvania, showed Laurel Hill Creek to be only slightly affected by mine drainage. The minimum pH recorded was 5.3, and an alkaline condition was indicated by 65 percent of the samples. Laurel Hill Creek discharged an average net alkaline load to the Youghiogheny during the study period. Only 11 mine discharges were inventoried in the Laurel Hill Creek drainage area.

Indian Creek enters the Youghiogheny River from the northeast, upstream from Connellsville, Pennsylvania. Indian Creek was consistently acid during the study and discharged an average daily acid load of approximately nine tons. The pH range was 2.9 - 5.9, and the average net acidity concentration was 82 mg/l. Additionally, in excess of one ton of iron per day was carried by Indian Creek.

An extensive, interconnected network of underground mine workings resulted in a large volume of mine water reaching Indian Creek.

Downstream from Connellsville, the Youghiogheny River was acidic 90 percent of the time and carried an acid load of about 63 tons per day (Station 410). In excess of 50 tons of acid per day was added to the main stream between Station 1360 at Confluence and Station 410 (Table 11). At least one-half of this increase in acid came from the Casselman River. Indian Creek, Mounts Creek, and a number of small tributaries along the west bank, between the communities of Confluence and Connellsville, contributed the remainder of the acid increase.

Jacobs Creek enters the main stream from the east at the Westmoreland-Fayette county line. This tributary discharged an average net alkaline load during the survey; however, acidic fluctuations occurred to a pH level of 4.6. Iron, hardness, and sulfate concentrations indicate that large quantities of acidity received by the stream had been neutralized by available alkalinity.

Sewickley Creek enters the main stream from the east at a point downstream from the Jacobs Creek area. Sewickley Creek was grossly polluted by mine drainage. Its average acidity concentration was 260 mg/l, the highest recorded in all Youghiogheny River basin streams. The alkalinity was completely depleted on every occasion, and the iron, sulfate, and hardness concentrations were also the highest encountered in the Youghiogheny River basin. The average acid load discharged by Sewickley Creek was in excess of 32 tons per day. This load is greater than that discharged by the Casselman River, a stream with a much higher volume of flow.

The Youghiogheny River at Sutersville, Pennsylvania (Station 1351) is representative of the pollutional loads and the cumulative water quality imparted to the stream by its multitude of mine drainage problem areas. The Youghiogheny River discharged an average daily net acid load of about 60 tons to the Monongahela River during the study period. Values of pH as low as 3.8 were recorded at this location. Concentrations of iron, hardness, and sulfate were consistently high and 17 tons of iron per day were transported to the Monongahela River.

Based on average daily acid loads discharged to the Monongahela River, the Youghiogheny River ranks third in magnitude or severity of pollution, among the four principal Monongahela River tributaries.

## Monongahela River

The Monongahela River flows 129 miles from its origin at Fairmont, West Virginia, to its confluence with the Allegheny River at Pittsburgh, Pennsylvania. The drainage area of the minor tributaries to the main stream is 1,769 square miles in northern West Virginia and southwestern Pennsylvania. This area is comprised of seven of the sub-basin units included in this study (Figures 1 and 2).

The seven sub-basins are:

| Sub-Basin No. | Sub-Basin |
|---|---|
| 1 | Lower Monongahela River |
| 2 | Redstone and Dunlap Creeks |
| 3 | Tenmile Creek |
| 4 | Middle Monongahela River |
| 5 | Dunkard Creek |
| 6 | Upper Monongahela River |
| 7 | Buffalo and Paw Paw Creeks |

The Monongahela River flows through one of the most intensively mined and valuable fuel resource areas in the world. Accordingly, many of the underground mines in the area were very large, and their respective volumes of mine water discharge were large. Although conditions have been modified somewhat in the interim by construction of mine water treatment plants, the U. S. Geological Survey made the following conclusion in 1963: ". . . the significant areas of acid discharges in the Monongahela River basin are along the main stem of the river between Fairmont, W. Va., and Braddock, Pa.: (near the mouth) . . . "The major acid mine drainage problems in the basin are in the small streams tributary to the mainstem. The bulk of the residual mineral acidity in the Monongahela River is received from this source." *

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* Statement on Water Resources Investigations in the Monongahela River Basin, U. S. Geological Survey, December 1963.

A total of 802 miles of streams in this drainage area were affected by mine drainage. This figure is more than double the comparable figures for the Cheat and Tygart river basins and is about 75 percent larger than the West Fork and Youghiogheny river basins.

The Monongahela River is an acid stream at its point of formation at Fairmont, West Virginia, and continues to deteriorate as acid tributaries enter it from both banks along its course to Greensboro, Pennsylvania. According to samples collected at Charleroi and Wilson, Pennsylvania, downstream from Greensboro, the quality of the river improved in net acidity concentrations and pH but continued to increase in hardness. A summary of pertinent stream water quality data from key locations on the main stream and a number of its polluted tributaries is presented in Table 13.

At Fairmont, West Virginia, the Monongahela River was acid 100 percent of the time(Station 130), poor in quality, and carried an average net acid load of about 118 tons per day. As previously noted, most of this load was from the West Fork River.

Buffalo Creek enters the main stream from the west just downstream from Fairmont, West Virginia. Buffalo Creek received mine drainage in the downstream half of its drainage area, but the stream was alkaline at Station 1302 during most of the study period.

Further downstream, Paw Paw Creek enters the main stream from the west bank. Similar to Buffalo Creek, Paw Paw Creek discharged a net alkaline load during the survey (Station 1301).

## Table 13

### Stream water quality data
### Monongahela River and minor tributaries

| Stn. Project Station No. | Location | No. Samples | Sampling Period | pH Range | Specific Conductance | Net Acidity[2] mg/l | Net Acidity[2] lb/day | % of Samples Acid | % of Samples Alkaline | Total Iron mg/l | Total Iron lb/day | Total Hardness mg/l | Sulfate mg/l |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 130[1] | Monongahela River, Lock 15, Fairmont, W. Va. | 12 | 7/65-5/66 | 3,9-6.2 | 483 | 54 | 236,136 | 100 | | 1.5 | 47,569 | 198 | 198 |
| 127[1] | Monongahela River @ Star City, W.Va. | 7 | 8/65-5/66 | 3.4-6.7 | 703 | 69 | 469,463 | 100 | | 3.3 | 237,707 | 367 | 371 |
| 1358 | Monongahela River @ Greensboro, Pa. | 21 | 8/65-12/67 | 2.9-6.5(15)* | 511(19) | 87 | [3] | 100 | | 5.3 | [3] | 169 | 261 |
| 1359 | Monongahela River @ Charleroi, Pa. | 35 | 4/65-12/67 | 3.3-5.6(32) | 522(37) | 54 | 965,398 | 100 | | 1.2 | 55,930 | 195 | 237 |
| 429[1] | Monongahela River @ Wilson, Pa. | 6 | 9/65-4/66 | 5.2-6.1 | 671 | 33 | 991,991 | 100 | | 2.6 | 283,714 | 312 | 296 |
| 1302 | Buffalo Creek @ Barrackville, W.Va. | 32 | 7/65-12/66 | 4.9-7.5(26) | 1738(29) | -57 | -6994 | | 91 | 1.9 | 393 | 519 | 863 |
| 1301 | Paw Paw Creek near Rivesville, W.Va. | 16 | 4/65-12/66 | 5.2-8.3 | 1543(15) | -81 | -4162 | | 88 | 6.9 | 982 | 429 | 547 |
| 1300 | Deckers Creek @ Morgantown, W.Va. | 32 | 8/65-12/67 | 3.5-6.6(25) | 880 | 87 | 2450 | 87 | | 6.5 | 451 | 390 | 426 |
| 1355 | Dunkard Creek @ Shannopin, Pa. | 40 | 4/65-12/66 | 2.7-5.5 | 2816(36) | 598 | 32,779 | 98 | | 74.7 | 4534 | 575 | 1464 |
| 1357 | Georges Creek @ New Geneve, Pa. | 8 | 4/65-12/67 | 3.1-4.1 | 770(12) | 192 | 61,203 | 100 | | 24 | 9915 | 222 | 262 |
| 1354 | Whitely Creek @ Paisley, Pa. | 16 | 4/65-12/67 | 3.1-6.5 | 2243(18) | 315 | 17,292 | 75 | | 76 | 4963 | 533 | 1025 |
| 1353 | South Fork Tenmile Creek @ Jefferson, Pa. | 24 | 4/65-7/67 | 5.3-8.4 | 425(23) | -87 | -29,135 | | 100 | 0.5 | 522 | 155 | 61 |
| 1365 | Redstone Creek @ Grindstone, Pa. | 10 | 4/65-12/67 | 3.4-6.6 | 1657(15) | -9 | -6286 | | 70 | 23.5 | 8201 | 663 | 750 |
| 1371 | Peters Creek @ Large, Pa. | 18 | 6/66-10/67 | 4.7-6.9 | 1440 | 0.7 | -1253 | | 55 | 2.5 | 579 | 522 | 583 |
| 1372 | Turtle Creek above mouth, Pa. | 2 | 4/68 | 5.6-6.0 | 891 | 22 | 19,205 | | 100 | 5.1 | 4550 | 375 | 358 |

[1] Sampling stations utilized by the Ohio River Basin Comprehensive Survey, FWPCA

[2] Negative values indicate net alkalinity

* Indicates the number of samples used in averages when other than the maximum

[3] Flow values for instantaneous discharges are not representative because of releases from Lake Lynn to generate power during periods of peak demand.

A daily net acid load in excess of one ton was measured in Deckers Creek at Morgantown, West Virginia. This tributary was acidic 87 percent of the time and carried high concentrations of mine drainage constituents (Station 1300).

The Monongahela River at Star City (near Morgantown, W. Va.) transported an average acid load of 235 tons per day (Station 127). This load is twice that measured a few miles upstream at Fairmont. The marked increase in load was due to the acid from tributaries such as Booths Creek, Deckers Creek, Scotts Run, and Robinson Run.

Dunkard Creek, located downstream from Pt. Marion, Pennsylvania, discharged an average daily net acid load in excess of 16 tons to the Monongahela River during the study period. The stream was consistently highly acid and highly mineralized. Dunkard Creek received large volumes of drainage from active underground coal mines (Station 1355).

Georges Creek enters the Monongahela River from the east near Greensboro, Pennsylvania, and discharged more than 30 tons of acid per day to the main stream.

Whitely Creek is another acid tributary that enters the main stream from the west near Masontown, Pennsylvania. Whitely Creek added almost nine tons of acid per day to the steadily increasing load in the Monongahela River.

Tenmile Creek, Redstone Creek, and Turtle Creek discharged average net alkaline loadings to the main stream in spite of the mine discharges within these watersheds. These tributaries are represented by stations 1353, 1365, and 1371, respectively.

Turtle Creek (Station 1372) enters from the east at the southeastern edge of the greater Pittsburgh, Pennsylvania, area. Turtle Creek was sampled on only two occasions and at those times it discharged nearly 10 tons of acid per day to the Monongahela River.

The Monongahela River at Charleroi, Pennsylvania,(Station 1359, 35 samples) was consistently acid, had a maximum pH of 5.6 and carried about 483 tons of acid per day. Downstream at Wilson, Pennsylvania, Station 429, a daily acid load of 446 tons was measured (six samples).

The Monongahela River was consistently acid over its total length of 129 miles. Net acidity concentrations averaged greater than 30 mg/l at all sampling stations and a maximum average of 87 mg/l was measured at the station at Greensboro, Pennsylvania. The pH ranged from 2.9 to 6.7. High concentrations of total iron, hardness, and sulfate were found at all sample stations on the Monongahela River.

## MINE DRAINAGE SOURCE INVENTORY

During the inventory, which continued from January 1965 through May 1968, a total of 7,002 sites associated with coal mining were located and described. The relative distribution of the mines and associated sites that were inventoried are presented in Tables 1, 2, 3, 14 and 15.

The distribution, by sub-basin and by type, of the mining sources that were found to be contributing drainage at the time of the survey, and the net acid and total iron loads discharged by the various major categories of sources are presented in Attachment A. The same information for the Monongahela basin as a whole is presented in Tables 14 and 15. Tables 1, 2 and 3 were developed from the data in Tables 14 and 15. The data for total number of each type of site is presented in Table 1. The data for total drainage number of each type of site is presented in Table 2. The data for groups of types of sites is presented in Table 3.

The following points are of particular significance:

1. Inactive sites comprised 92 percent of all sites, 90 percent of the draining sites and contributed 65 percent of the net acid load and 60 percent of the iron load.
2. Active sites comprised only 8 percent of all sites and 10 percent of the draining sites but contributed

TABLE 14

SUMMARY OF SITES IN THE MONONGAHELA RIVER BASIN

by Types

| | | Drift | Strip | Shaft and/or Slope | Strip & Drift | Strip & Auger | Prep. Plant. | Refuse Pile | Coal Storage Area | Shaft & Strip | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **ACTIVE SITES** | | | | | | | | | | | |
| No. of Sites | Dry | 114 | 96 | 12 | 6 | 6 | 21 | - | | | 255 |
| | Draining | 164 | 53 | 21 | 26 | 26 | 33 | 1 | | | 306 |
| | Total | 278 | 149 | 33 | 32 | 14 | 54 | 1 | | | 561 |
| Load (lbs/day) | Net Acid | 224,076 | 14,428 | 73,645 | 56,549 | 1,444 | 9,541 | 0 | | | 379,683 |
| | Total Iron | 62,367 | 3,911 | 43,023 | 7,973 | 1,275 | 2,912 | 0 | | | 121,461 |
| **INACTIVE SITES** | | | | | | | | | | | |
| No. of Sites | Dry | 1,718 | 1,584 | 146 | 187 | 18 | 37 | 10 | 1 | - | 3,701 |
| | Draining | 1,655 | 738 | 24 | 263 | 47 | 5 | 7 | | 1 | 2,740 |
| | Total | 3,373 | 2,322 | 170 | 450 | 65 | 42 | 17 | 1 | 1 | 6,441 |
| Load (lbs/day) | Net Acid | 436,049 | 92,012 | 33,910 | 120,565 | 13,402 | 1,044 | 2,910 | - | -0 | 699,892 |
| | Total Iron | 114,384 | 15,043 | 27,622 | 20,807 | 2,453 | 113 | 1,013 | - | 0 | 181,435 |
| **TOTAL SITES** | | | | | | | | | | | |
| No. of Sites | Dry | 1,832 | 1,680 | 158 | 193 | 24 | 58 | 10 | 1 | - | 3,956 |
| | Draining | 1,819 | 791 | 45 | 289 | 55 | 38 | 8 | - | 1 | 3,046 |
| | Total | 3,651 | 2,471 | 203 | 482 | 79 | 96 | 18 | 1 | 1 | 7,002 |
| Load (lbs/day) | Net Acid | 660,125 | 106,440 | 107,555 | 177,114 | 14,846 | 10,585 | 2,910 | - | -0 | 1,079,575 |
| | Total Iron | 176,751 | 18,954 | 70,645 | 28,870 | 3,728 | 3,025 | 1,013 | - | 0 | 302,896 |

## Table 15

## SUMMARY OF SITES IN THE MONONGAHELA RIVER BASIN BY GROUPS

**Total No. of Sites** 7002 **Total Net Acid** 1,079,575 **lbs/day** **Total Iron** 302,896 **lbs/da**

| | Underground[1] | Surface[2] | Combination[3] | Other[4] | Total |
|---|---|---|---|---|---|
| Active Sites | | | | | |
| Dry | 126 | 102 | 6 | 21 | 255 |
| Draining | 185 | 61 | 26 | 34 | 306 |
| Total | 311 | 163 | 32 | 55 | 561 |
| Net Acid lbs/day | 297,721 | 15,872 | 56,549 | 9,541 | 379,683 |
| Total Iron lbs/day | 105,390 | 5,186 | 7,973 | 2,912 | 121,461 |
| Inactive Sites | | | | | |
| Dry | 1,864 | 1,602 | 187 | 48 | 3,701 |
| Draining | 1,679 | 785 | 263 | 13 | 2,740 |
| Total | 3,543 | 2,387 | 450 | 62 | 6,441 |
| Net Acid lbs/day | 469,959 | 105,414 | 120,565 | 3,954 | 699,892 |
| Total Iron lbs/day | 142,006 | 17,496 | 20,807 | 1,126 | 181,435 |
| Total Sites | | | | | |
| Dry | 1,990 | 1,704 | 193 | 69 | 3,956 |
| Draining | 1,864 | 846 | 289 | 47 | 3,046 |
| Total | 3,854 | 2,550 | 482 | 116 | 7,002 |
| Net Acid lbs/day | 767,680 | 121,286 | 177,114 | 13,495 | 1,079,575 |
| Total Iron lbs/day | 247,396 | 22,682 | 28,780 | 4,038 | 302,896 |

1. Includes drift mines and shaft and/or slope mines.

2. Includes strip mines and strip and auger mines.

3. Includes strip and drift combination mines.

4. Includes refuse piles, preparation plants, a coal storage area and a shaft and strip mine.

35 percent of the net acid load and 40 percent of the iron load.

3. Underground sites, both active and inactive, comprised 55 percent of all sites, 61 percent of the draining sites and contributed 71 percent of the net acid load and 82 percent of the iron load. Inactive underground sources contributed 43 percent of the net acid load and 47 percent of the iron load and thus were the largest contributors to stream degradation.

If it is assumed that the drainage from combination underground-surface sources originates primarily in underground mines, then underground mines were responsible for nearly 88 percent of the net acid and 91 percent of the iron entering Monongahela River basin streams. By this assumption the contribution of inactive underground mines was about 55 percent of the net acid load and 54 percent of the iron load.

In addition to the overall statistics, the relative distribution of pollution sources within the Monongahela basin is of importance. It was found that:

1. The pollutional contribution from active mines was greatest in the Middle and Upper Monongahela River, Lower West Fork River, Lower Tygart River, Lower Cheat River, Lower Youghiogheny River, and Sewickley Creek sub-basins. Discharges from active underground

mines were the primary source of stream degradation only in the Upper Monongahela River sub-basin.

2. Water quality in watersheds in the central portion of the Monongahela River Basin was degraded by pollutants both active and inactive mine sources; water quality in the headwaters areas was degraded principally by pollutants from inactive sources.
3. It was generally true that a relatively small number of sources in an area contributed most of the pollution. This does not appear on the statistical analyses shown and only becomes apparent upon detailed study of the individual sub-basins. The average amount of net acid contributed per source varied greatly among the sub-basins.

## MINE DRAINAGE POLLUTION CONTROL

Renewed interest in abating coal mine drainage pollution has resulted in numerous recent publications concerning pollution control methods, their costs, and their effectiveness. The following reports are considered particularly pertinent:

1. "Principles and Guide to Practices in the Control of Acid Mine-Drainage Supplemented by Case Histories," Prepared by the Coal Industry Advisory Committee to ORSANCO and published by ORSANCO, March 1964.
2. "Handbook of Pollution Control Costs in Mine Drainage Management," Prepared by John R. Hyland, Project Director, Monongahela River Mine Drainage Remedial Project and the Advisory Work Group to the Project and published by the U. S. Department of the Interior, FWPCA, December, 1966.
3. "Survey of Costs on Methods for Control of Acid Mine Drainage Pollution," Prepared by R. W. Stephan and W. C. Lorenz of the U. S. Bureau of Mines in 1968 for publication as Attachment E to Appendix C of the "Development of Water-Resources in Appalachia." This survey will also appear as Attachment E to

3. Appendix C of "Acid Mine Drainage in Appalachia," a report by the Appalachian Regional Commission.
4. "Mine Drainage Treatment - State of the Art and Research Needs," Prepared by R. D. Hill of the Federal Water Pollution Control Administration and published by FWPCA, December, 1968.
5. "Engineering Economic Study of Mine Drainage Control Techniques," Prepared by Cyrus Wm. Rice and Company and published January 15, 1969 for inclusion as Appendix B to "Acid Mine Drainage in Appalachia," a report by the Appalachian Regional Commission.

An immediate and important conclusion that can be reached from examination of the publications is that while there are a number of potentially applicable techniques (Cyrus Wm. Rice lists 23), only a few can be practically applied, and the number of alternatives becomes smaller still when examining a specific pollution source.

Mine drainage pollution methods are divisible into treatment methods and other techniques. Among the other techniques are at-source controls which attempt to prevent the oxidation of pyrite by physical, chemical, or biological means or to divert away surface and ground water that dissolves and carries away the pyrite oxidation products. Additional non-treatment techniques for controlling the effects of acid drainage pollution are the various means of hydrologic regulation such as, controlled release of pollutants and flow augmentation.

At the present time, known practical at-source methods are limited to the diversion of water away from mines or coal refuse piles, reclamation of surface mined land and refuse disposal areas, and the sealing and flooding of underground mines.

There exists a long list of processes by which acid drainage can be treated, including all of the desalination techniques. However, the treatment method presently considered to be practical for use on an operating basis is neutralization, primarily with hydrated lime or limestone, and the associated processes of oxidation, settling, and filtration for removal of iron, manganese and aluminum. Neutralization or iron and manganese removal alone may be used depending on the chemical composition of the drainage. Lime or limestone neutralization will raise the pH to an acceptable level, but the content of dissolved chemicals and hardness is not reduced and, in fact, is increased since calcium ions are substituted for hydrogen ions.

## ACTIVE MINING OPERATIONS POLLUTION CONTROL

The control of drainage pollution from active mining is considered to be the responsibility of the mine operator, with the regulations for control established and enforced by the states. Ohio River Valley Water Sanitation Commission (ORSANCO) Resolution No. 5-60 outlines the control measures that were suggested by the Coal Industry Advisory Committee and adopted by the Commission. The measures are:

"I. (a) Surface waters and ground waters shall be diverted where practicable to prevent the entry or reduce the flow of waters into and through workings.

(b) Water that does gain entry to the workings shall be handled in a manner which will minimize the formation and discharge of acid mine-drainage to streams.

II. Refuse from the mining and processing of coal shall be handled and disposed of in a manner which will minimize discharge of acid mine drainage therefrom to streams. Where acid-producing materials are encountered in the overburden in stripping operations, these materials shall be handled so as to prevent or minimize the production of

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acid mine-drainage, taking into consideration the need for stream pollution prevention and all economic factors involved.

III. Discharge of acid mine-drainage to streams shall be regulated insofar as practicable to equalize the flow of daily accumulations throughout a 24-hour period.

IV. Upon discontinuance of operations of any mine all practicable mine-closing measures, consistent with safety requirements, shall be employed to minimize the formation and discharge of acid mine-drainage.

V. Under appropriate circumstances, consideration shall be given to the treatment of acid mine-drainage by chemical or other means in order to mitigate its pollutional properties."

On January 8, 1970 ORSANCO adopted Resolution No. 1-70, supplement to Resolution No. 5-60 which adds the following control measures:

"VI. Whenever all applicable provisions of Resolution No. 5-60 have been carried out and a polluting discharge emanates from an active mining operation, this discharge shall be so treated or otherwise modified to such degree as may be necessary to meet water quality standards established for the receiving stream.

VII. All mines that are newly opened, reopened or expanded shall be planned and developed in such a manner that will minimize pollution discharges after completion of mining and proper closure procedures."

These measures and the operating, planning, and administrative techniques relating to their practical application as suggested in the ORSANCO publication, "Principles and Guide to Practices in the Control of Acid-Mine Drainage," provide a firm basis for effectively controlling drainage pollution from active mines.

It is reasonable to expect that drainage pollution from active mines can be controlled because it is, in many cases, feasible to treat the polluted drainage that remains after other corrective measures have been applied. State programs that are now in effect in Pennsylvania demonstrate that this expectation is correct.

Estimates have not been made of the costs that will be experienced by the coal industry in implementing programs for control of water pollution from active coal mining in the Monongahela River basin. Such costs will, however, be much less than the cost of dealing with abandoned mine sources and, if mine operation and abandonment are properly carried out, the future abandoned mine pollution problem will be minimized.

## INACTIVE OR ABANDONED MINE POLLUTION CONTROL

Abating pollution from inactive mines is a task the cost and success of which is difficult to accurately predict at this time, even for small areas. The difficulty derives from the fact that there is little experience with watershed-scale abatement projects upon which to base estimates of cost and effectiveness.

### Cost Estimation

There is considerable pertinent information available concerning the cost of reclaiming surface mined land and some current information available concerning the unit cost of mine sealing and refuse pile reclamation. Methods of drainage diversion are not readily amenable to unit costing, since they are highly dependent on the individual site and since there is not much experience to draw upon. As corrective projects progress, the costs experienced will provide the basis for further projections.

Considerable effort was expended by the Monongahela Project staff and the project Advisory Work Group to obtain and analyze cost data for the various methods of controlling drainage pollution from inactive coal mine sources. A discussion of the methods and analysis of the data is presented in the "Handbook of Pollution Control Costs in Mine Drainage Management" (U. S. Department of the Interior, FWPCA, 1966). Since the preparation of this handbook, several other significant efforts have been made to compile data on the cost and, in some cases, effectiveness of these techniques. The resulting publications were previously listed.

The very recent and comprehensive report of Cyrus Wm. Rice and Company presents cost data for surface reclamation, mine sealing and drainage diversion. The cost data and their analysis is presented in a more detailed form than in any previous study.

Data from 125 reclamation projects in the Appalachian area were used by Cyrus Rice and Company for their analysis of the unit cost of reclaiming abandoned surface-mined areas. The cost data were presented for 22 selected reclamation projects on abandoned strip mines. These costs ranged from $420 per acre to $2,598 per acre in 1967 dollars. There is, however, no means to compare the physical circumstances or amount of reclamation work done in the various projects. If it is assumed that the 22 projects represent an average cross section, then an average cost figure is useful.

The average per acre cost (total cost/total acres reclaimed) of the 22 projects was $560. The average cost for "basic reclamation" of land disturbed by bituminous coal mining in the Appalachian Region States in 1964 ranged from $131 in Maryland to $361 in Pennsylvania.[1] The over-all average was $302 per acre. Cost

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[1] U.S. Department of the Interior, 1966, Study of Strip and Surface Mining in Appalachia: Published by U.S. Govt. Printing Office, Washington, D. C.

data obtained by this project showed a range of from $71 per acre to $631 per acre. The average cost of projects in Pennsylvania was $386 in 1966. Based on the cost data from these several studies, a cost of $500 per acre for surface reclamation seems a reasonable figure to assume for a large-scale effort which would encounter all types of conditions. The cost per acre in individual small areas could obviously be less or could be much greater.

The cost of abating pollution from refuse piles can be expressed in various ways, including the cost per unit volume of refuse material involved or the cost per unit area of surface rehabilitated. The unit area or per acre cost of rehabilitating refuse piles is more easily applied here. The costs of completely rehabilitating abandoned refuse piles to something like the original terrain and forest cover are reported by Cyrus Rice and Company to range from $1,000 to $3,000 per acre. The average cost of refuse pile reclamation in Moraine State Park, Pennsylvania was $1,234.50 per acre (as reported by Cyrus Rice and Company). An average cost of $2,000 per acre will be assumed here for refuse pile reclamation.

An extensive coal mine sealing effort was conducted during the early 1930's under the sponsorship of the Works Progress Administration and sealing projects of a limited scope were subsequently performed under State sponsorship in Pennsylvania and West Virginia. Cost data are available from some of the projects and are presented in the handbook of costs prepared by the Monongahela River Project. Additional data on mine seals constructed more recently are presented there also.

The usefulness of the data for cost of seals is questionable because no systematic evaluation of the effectiveness of the seals has been made and seal cost and effectiveness are both related to the extent of construction. The effectiveness of all types of mine reclamation is generally unknown at the present time.

Because of the poor quality of the information from older projects, the newer data from the FWPCA Mine Drainage Demonstration Project at Elkins, West Virginia, the FWPCA sponsored feasibility study carried out by the Halliburton Company and the Moraine Park mine drainage abatement project of the State of Pennsylvania are the most reliable sources of cost data. Even in these three instances, there has not yet been established a relationship between cost and effectiveness.

The cost for building masonry mine seals at Elkins, West Virginia, ranged from $2,000 to $6,000 per seal, including cleanup of mine openings, timbering, concrete footers, concrete block walls, urethane foam coating of the seals, and overhead costs.

The Halliburton Company has experimented with several types of mine seals that are described in Appendix E. The cost of the various seals constructed to date are:

| | Type of Seal | Experienced Cost |
|---|---|---|
| 1. | Expendable Grout Retainer. | $5,000 |
| 2. | Pneumatic Placement of Limestone and subsequent Grouting. | $5,200 |
| 3. | Sodium Silicate Bulkheads w/25' of Filler[1]. | $3,500 |

Probably the most realistic and useful figures are those from Pennsylvania's Moraine Park mine drainage abatement project. However, since there was little information and experience on which to base bids, it is believed that these do not yet represent real costs. In this project, the contractor was required to furnish all labor, equipment and materials for the installation of 53 hydraulic mine seals. In addition to sealing the openings, grout curtains were formed around the seals to insure the capability of the seals to retain water in the mines. The average bid price for the seals alone was $7,000 each. The average bid price of each seal, including associated grouting was $12,000 to $16,000 per seal. It is believed that the total cost of sealing plus grouting is a more realistic figure than that of the seals alone.

The unit costs as given above can be applied to the number of pollution sources that have been inventoried in order to obtain an order-of-magnitude estimate of the cost of an at-source pollution abatement program. The results are shown in Table 6. These costs amount to about $60,000,000. To this must be added the costs of engineering design, acquisition of land and mineral rights, the

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[1] The one seal that was constructed cost $1,300 but this seal had only a 6' filler. The projected cost with a 25' filler is $3,500.

costs of maintaining the constructed facilities, and other miscellaneous costs. There is no logical way to estimate such costs as acquisition of land and mineral rights at this time. Nor is it known that mineral rights would have to be acquired in every case. In a comprehensive program, such costs could be very great, since areas could be involved where there are substantial coal reserves remaining.

A major defect in the cost estimate is considered to be the cost for underground mine sealing. This estimate is considered defective because the history of early underground mining and subsequent strip mining that is common in the Monongahela basin created more openings to underground mines than originally existed and left many of these openings covered. Preliminary surveys of the present type are not adequate in such situations. If the pessimistic assumption were made that all areas would be equally as complex as ones that have been examined in detail in the Upper West Fork River area and in the Upper Tygart River area, the cost of mine sealing alone would be more than ten times the amount shown in the above table or more than $486 million.

A second major defect in the above order of magnitude cost figures is that the effectiveness of the proposed measures is unknown. If the reduction of pollutants were sufficient from at-source techniques alone, no drainage treatment would be required. Using present technology, however, it is certain that treatment would be required in many areas before a comprehensive program could achieve the desired results.

Costs for treatment by lime neutralization are estimated to be from \$0.30 to over \$1.00 per 1,000 gallons of mine drainage. Costs experienced during operation of a mobile pilot plant at six sites[1] indicate that the average cost of lime neutralization at these sites would be about \$70 per ton of acidity neutralized during full-scale plant operation. The range of costs is indicated as generally from about \$25 to \$110 per ton of acidity neutralized. Cost estimates prepared for the FWPCA by a consulting firm for 30 plants in five areas of the Susquehanna River basin indicate that costs for construction of lime neutralization treatment plants will range from \$50,000 to \$250,000 per ton of acidity treated per day, with an average construction cost of \$100,000 per ton of acidity treated per day. Data from Messrs. Charmbury, Maneval, and Girard indicate an anticipated average construction cost of about \$145,000 per ton of acidity treated per day for the six treatment plants they considered.

Using the intermediate figure of \$125,000 per ton of acidity treated per day for construction, the initial cost of plants for treating 168 tons per day of acid, or 50 percent of that entering Monongahela basin streams, excluding sub-basins 1 and 2, each day from abandoned mines would be \$21,000,000. The annual operation cost of such plants, including amortization, interest, sludge disposal and all other costs would be \$6,132,000 at the projected average cost of $100 per ton of acid neutralized. Operation costs would total $122,640,000 over the 20-year period that the plants were calculated to last, then new plants would have to be constructed.

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[1] Charmbury, H. B., Maneval, D. R., and Girard, Lucien, 1967, Operation Yellowboy - Design and Economics of a Lime Neutralization Mine Drainage Treatment Plant, paper presented at the 96th annual meeting of the AIME, Los Angeles, February, 1967.

To summarize, the initial cost of a comprehensive program for at-source control of acid mine drainage in the Monongahela basin would exceed $60 million and could be greater than $498 million. Such a program would need to be supplemented by treatment to be completely effective. If at-source control were only 50 percent effective, then the initial investment in treatment plants would have to be in the order of $21,000,000. Using present average cost projections, plant operating cost would be about $6,132,000 annually and the total cost over a 20-year period would be about $144,000,000. Total estimated costs for at-source abatement and water treatment range from $218 million to $656 million for a 20-year period. These costs are only presented to indicate the order of magnitude of funds required. Meaningful estimates can only be obtained by working with small representative areas on a trial abatement basis to obtain data that are known to be reliable.

## EFFECTIVENESS

Equally as important as the cost of the at-source methods as discussed in the previous section is the relative effectiveness of the methods in abating mine drainage pollution after they have been applied. Surprisingly, the effectiveness of the various abatement methods has received relatively little discussion in comparison with discussions of the unit cost of applying them. This is true in spite of the fact that, in many cases, the degree of effectiveness is probably closely related to the amount expended in applying a technique.

For example, the effectiveness of surface reclamation in controlling acid formation depends on the degree to which acid-forming material can be buried and kept beneath the surface. Such successful burial frequently depends on establishing a healthy vegetative cover that will stabilize the soil surface, thus preventing continued erosion and accompanying exposure of new pyrite surfaces. In such cases, surface reclamation must be complete; simply regrading the surface will not achieve the desired purpose.

Hill[1] recently discussed the effectiveness of surface reclamation at Elkins, West Virginia. Based on one year's observation, the quality of runoff water from reclaimed areas has improved, but is still poor. It is expected that, as the grass cover is established and erosion is controlled, the water quality will continue to improve. The eventual extent of improvement is not quantitatively predictable but it is expected that it will be significant. This expectation is supported by observation, if not by carefully gathered engineering data.

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[1] Hill, R. D., 1969, The Effectiveness of Mine Drainage Pollution Control Measures, Elkins, W. Virginia, Paper presented before the American Chemical Soc., Minneapolis, Minn., April, 1969, by R. D. Hill, Federal Water Pollution Control Admin., Robt. A. Taft Sanitary Engineering Center, Cincinnati, Ohio.

The extent to which mine sealing will be effective is a most important unresolved question. It is most important because 40 to 50 percent of the acid drainage originates from inactive underground mines. All available information indicates that sealing a mine with the objective of preventing air from entering is not effective to any substantial degree and such sealing is, therefore, excluded from consideration as an abatement tool at this time.

There is, however, every reason to believe that a mine seal or seals that will impound water and permanently flood a mine to above the level at which the pyrite occurs will effectively reduce the rate of pyrite oxidation and the consequent rate of acid production. The unknown in this case is the extent to which mine flooding can be accomplished. Inactive mines below the natural drainage level flood naturally.

It may or may not be feasible to flood an above-drainage mine that is contributing acid pollution, depending on the physical circumstances. It is certain that some mines will be sealable and others not, but there is insufficient experience to indicate the relative numbers of each category.

In cases where hydrologic control and at-source methods are not sufficiently effective, treatment of some type can obviously be used, the constraint being the costs involved.

# STATE LAWS AND PROGRAMS

## MARYLAND

### Legal Authority to Control Pollution Caused by Mine Drainage

It is the opinion of the Maryland Attorney General that: "The Department of Water Resources, Pursuant to Sections 23, 24, 25, Article 96A of the Annotated Code of Maryland, is charged with enforcement of all laws relating to the pollution of the waters of the State of Maryland."

This opinion was provided by the Attorney General in 1966 in response to the question as to "Which among Maryland Geological Survey, Bureau of Mines, and Department of Water Resources has the most effective powers for stopping pollution by acid mine drainage." The 1969 session of the Maryland General Assembly created the Maryland Department of Natural Resources. The aforementioned agencies are included within this new Department.

The authority to develop and enforce certain regulations designed to minimize the formation of acid drainage from strip mining is given to the Maryland Bureau of Mines through Sections 657 through 674 of Article 66C of the Annotated Code of Maryland, as revised in 1967.

House Bill 630[1], which became effective July 1, 1969, created the Land Reclamation Committee. The Committee will study, recommend, and approve procedures for reclamation, conservation, and revegetation of areas affected by surface mining. Mining and reclamation plans submitted for surface mining permits are to be reviewed and approved by the Committee prior to permit approval.

The Maryland General Assembly passed the "Abandoned Mine Drainage Control Act of 1970." This act authorized the Secretary of Natural Resources to take action to abate mine drainage from abandoned mines.

## Responsibilities and Functions of State Agencies Involved in Mine-Drainage Control

The pollution control responsibilities of the Maryland Department of Water Resources (MDWR) and the Maryland Bureau of Mines (MBM) are shown in the following table:

POLLUTION CONTROL RESPONSIBILITY

| | Active | | Coal | Inactive | | Refuse |
|---|---|---|---|---|---|---|
| | Strip | Deep | Washeries | Strip | Deep | |
| MDWR | yes | yes | yes | yes | yes | yes |
| MBM | yes | no | no | no | no | no |

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[1] Article 66C sections 660a through 660b, Annotated code of Maryland

## Control of Pollution from Active and Proposed Mining Operations

Mine effluents are defined by the regulations of the Maryland Department of Water Resources (MDWR) as being industrial discharges; and, therefore, subject to the same discharge requirements. Enforcement of these requirements on active mines is being initiated by the MDWR. Permits are not being required by the MDWR with the expectation that review of the Mining and Reclamation Plan by the Land Reclamation Committee will be adequate to require the adoption of measures to control drainage from strip mines. Where the effluent is found to violate the industrial waste requirements, MDWR requires waste treatment under the Water Resources Laws. Enforcement of the industrial-waste requirements for active deep and strip mines has already begun by MDWR.

Plans and permits required under strip mining laws and regulations are designed to prevent pollution during mining and after strip mining is completed.

At present, steps are being taken to prevent pollution after deep mining is completed.

The Maryland Bureau of Mines (MBM) has three full-time mine inspectors who inspect for compliance with MBM regulations, only part of which deals with pollution. MBM averages 40 mine inspections per week. MDWR has one employee who spends part-time on mine inspections. The MDWR averages seven mine inspections per week.

## Control of Pollution from Abandoned Mines

Administratively, and legally, an inactive mine becomes an abandoned mine when, as specified in the strip mining law," . . . no coal has been produced or overburden removed for a period of one year." The Water Resources Law does not define inactive or abandoned.

All coal mines in Maryland were inventoried during the Western Maryland Mine Drainage Survey (1962-1965).[1.] This included inactive, active, and abandoned mines, both deep and strip. Mining has continued since publication of this Survey, so it is not completely accurate in reflecting current conditions. In conducting this survey, 400 man-days were consumed and 20,000 miles covered. Total cost is estimated at $25,000. Mine status and locations are kept up to date through active mine inspections made by the Maryland Department of Water Resources.

The "Abandoned Mine Drainage Control Act of 1970" [1,2.] authorized the Secretary of Natural Resources to acquire and rehabilitate land occupied by abandoned deep and strip mines in order to abate pollution. The legislation authorizing this Act also authorized $5,000,000 bond issue.

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1. Hopkins, T.C., Jr., Western Maryland Mine Drainage Survey 1962-1965: Maryland Department of Water Resources, Water Quality Division, Vols. 1&2, parts 1-6.

2. Art. 66C section 674A through 674H. Annotated Code of Maryland.

The implementation of this Act has been assigned to the MDWR, and the preliminary investigations are underway.

## Progress in Mine-Drainage Control

At the present time, several mining operations are providing treatment prior to discharging the effluent to a stream.

No data are available by which to accurately assess the effectiveness of the reclamation program. While some acid discharges have been eliminated by backfilling, we know of no streams which have significantly improved in quality as a result. In order to define and pinpoint any improvements or additional degradation in water quality, the Maryland Department of Water Resources makes three surveys per year on streams affected by mine drainage.

A total of 1748 acres of land disturbed by strip mining had been reclaimed through December, 1964. From January 1966 through December 1970, 1559 acres of disturbed land had been reclaimed.

## PENNSYLVANIA

### Legal Authority to Control Pollution Caused by Mine Drainage

A. April 22, 1905 - Purity of Waters Act

This was the first comprehensive statute concerned with the purity of the streams of the Commonwealth and was entitled "An Act to Preserve the Purity of the Waters of the State for the Protection of the Public Health." This law made no mention of mine drainage pollution control and was concerned primarily with the effect of sewage pollution on public water supplies.

B. June 22, 1937

This was Pennsylvania's first Clean Streams Act which involved the control of pollution from domestic sewage and industrial wastes, but mine drainage was specifically excluded from the provisions of the law.

C. May 8, 1945

This amendment to the Clean Streams Law made it unlawful to discharge acid mine drainage ". . .into 'clean waters' of the Commonwealth which are being devoted or put to public use at the time of such discharge. . ." The law required that prior to opening or reopening or continuing in operation of a coal mine, that the plan of drainage of the operation be approved by the Sanitary Water Board. In implementing this law, the

Board passed Rules and Regulations including the following:

1. In those cases in which the proposed discharge of the drainage would be to an already polluted or unclean stream, or to an insignificant clean stream not devoted to public use and which in turn flows into a polluted stream, the Board may grant a permit.
2. In those cases in which the proposed drainage would be into a clean stream and there is no evidence that the drainage will be acid, the Board could grant permits provided that no acid discharges were expected to emenate from the operation. About 125 small lime neutralization plants were constructed as part of operators' plans if drainage to meet this requirement.
3. In those cases in which the proposed discharge would be into a polluted or an unclean stream, which in turn flows into a clean stream, the Board could issue permits provided that the expected discharge would not adversely affect the secondary receiving stream.

D. August 8, 1963

On this date, the Bituminous Coal Open Pit Mining Conservation Act was last amended to control the restoration measures on all open pit mines in Pennsylvania. This amendment required the annual licensing of bituminous open pit mine operators for a fee of $300. It also required that the area to be mined be bonded for not less than $500, nor more than $1,000 per acre, based upon the number of acres of land in each operation which will be affected by mining during the following year. No bond may be less than $5,000. Any person violating this act shall be guilty of a misdemeanor and upon conviction shall be sentenced to pay a fine of not less than $5,000 and not exceeding $10,000 or undergo imprisonment not exceeding six months or both.

Pennsylvania's first act to control bituminous open pit mining was approved in 1945 and was amended in 1949, 1953, 1956, 1959, 1961, and 1963. Each time, the backfilling, licensing, bonding, and penalty provisions were strengthened.

E. August 23, 1965

This amendment reflected the Leglislature's concern with the continued loss of streams to mine drainage pollution under existing laws and controls. The Pennsylvania General Assembly declared it to be the policy of the Commonwealth of Pennsylvania that "It is the objective of the Clean Streams Law not only to prevent future pollution of the waters of the Commonwealth, but also to reclaim and restore to a clean, unpolluted condition every stream in Pennsylvania that is presently polluted. . ." The Legislature felt that mine drainage should be considered similar to any other industrial wastes and that those discharging mine drainage should not be permitted to cause pollution regardless of the condition of the receiving stream. This amendment also required that all mines operating at the time of passage of the law and all subsequent proposed mines submit applications for permits to the Sanitary Water Board. Such applications must be supported by technical data indicating how the mine will prevent pollution both during operation of the mine and upon completion of mining. As part of the implementation of the act, the Sanitary Water Board established discharge limitations on effluents from mining operations.

E. July 31, 1970

On July 31, 1970, Pennsylvania Legislature modernized Pennsylvania's Clean Streams Law. The law broadened regulatory control over all mineral extraction operations and strengthened the enforcement provisions. The law contained civil penalty provisions which allowed the Commonwealth to assess penalties of $10,000 plus $500 a day for each day of continued violation. The law also established the Clean Water Fund into which all fines collected under the provisions of the law are paid. The Clean Water Fund is to be used for the elimination of pollution.

One of the most important provisions of the 1970 amendments is that which permits regulation of potential pollution. It allows the Commonwealth to control situations which create or may create a potential pollution hazard.

G. December 3, 1970

On December 3, 1970, the Pennsylvania Legislature established the Department of Environmental Resources effective January 19, 1971. The act creating this new Department abolished two Commonwealth agencies - the Department of Mines & Mineral Industries and the Department of Forests & Waters - and abolished the Sanitary Water Board. All duties and functions of the Departments and Board were transferred to the new Department. The law also transferred all environmental protection functions of the Department of Health to the new Department.

The law created two departmental Boards - one known as the Environmental Quality Board which is responsible for developing the Commonwealth's environmental plan and for promulgating Rules & Regulations for the Department, and the other known as the Environmental Hearing Board which is responsible for holding hearings and issuing adjudications.

An Advisory Board, known as the Citizens Advisory Council, was also established by the law and is responsible for rendering advice to the Department and for reviewing the recommended changes in legislation.

## Responsibilities and Functions of the State Agencies Involved in Mine Drainage Control

As a result of the foregoing, all references in the Clean Streams Law must be interpreted to conform with the changes in governmental structure. References in the law to the Department of Health and the Department of Mines & Mineral Industries should be interpreted as referring to the Department of Environmental Resources. References to the Sanitary Water Board and its policy in rule-making should be interpreted as referring to the Environmental Quality Board. References to the Sanitary Water Board in its adjudicatory capacity should be interpreted as referring to the Environmental Hearing Board. Any other references to the Sanitary Water Board should be interpreted as referring to the Department of Environmental Resources.

A. Sanitary Water Board

The administrative Code of 1929 established the Sanitary Water Board as an administrative board within the Department of Health. The Board consists of four cabinet-level heads, the Secretaries of Health (who acts as Chairman), Mines and Mineral Industries, Forests and Waters, and Commerce. The Board also contains the Executive Director of the Fish Commission and three public members appointed by the Governor. Some of the more important activities of the Board are:

1. Establishing broad policy regarding water quality management of the State's streams.

2. Establishing rules and regulations for administration of the Clean Streams Act.
3. Considering the facts and recommendations presented on applications and authorizing or refusing issuance of permits.
4. Modifying permits when such modifications are needed to prevent stream pollution.
5. Holding hearings on applications at request of either the applicant or a party which may be adversely affected by a proposed mining operation or by an active operation.
6. Ratifying action taken by the Chairman between Board meetings in issuing notices and orders.

B. Agents of the Board

1. The Department of Health is the investigating, examining, reporting, and enforcement agent of the Board in all cases dealing with anthracite deep and strip mines and bituminous deep mines. The Bureau of Sanitary Engineering within the Department is specifically the Board's agent which reviews the engineering aspects of applications and plans for proposed mining operations. The Bureau also carries out the enforcement aspects of the Clean Streams Law and the Rules and Regulations of the Board.
2. The Department of Mines and Mineral Industries is the reporting agency to the Board for all cases pertaining to

bituminous strip mines, oil and gas wells, and coal mine refuse disposal. The Bureau of Bituminous Conservation and Reclamation of the Department reviews applications and plans for proposed bituminous strip mine operations and makes recommendations to the Sanitary Water Board. The Bureau also reports to the Land Reclamation Board in the Department of Mines and Mineral Industries concerning the backfilling and other reclamation requirements as set forth in the 1963 amendments to the Bituminous Coal Open Pit Mining Conservation Act.

## Control of Pollution from Active and Proposed Mining Operations

### A. Submission of Mining Plans or Plans of Drainage

Prior to the commencement of any mining operation, the operator must first receive a permit from the Sanitary Water Board for operation of the mine and, where appropriate, for the discharge of industrial waste (mine drainage) to waters of the Commonwealth. An application for such a permit must include plans and engineering data which shows the manner in which pollution will be prevented during and after operation of the mine.

1. Deep mine applications must include geologic structure maps showing the manner in which the mine will be developed. The development plans must include the maintenance of ade-

quate barriers around the mine's outcrops and property lines as well as between the proposed workings and existing strip mines. The mine development plans must also include all other relevant hydrogeologic data which would be pertinent in determining the probability whether the mine can be successfully sealed to prevent pollution upon completion of mining.

If a mine drainage discharge is anticipated that will not meet the Board's discharge standards, then the application must include plans for the treatment of the mine drainage. The minimum quality of water permitted to be discharged would have a pH between 6 and 9, contain no acid, and a total iron concentration of 7 mg/l or less. If special conditions warrant, more stringent discharge requirements may be required.

2. Open pit or strip mine applications must be supported by plans showing the manner in which any drainage from the mine will be treated to meet the Sanitary Water Board's discharge requirements. This application sets forth the manner in which the mine will be operated to minimize formation of pollution and how it will be restored to prevent pollution after completion of mining. Before any person operates a bituminous open pit mine, he must first be licensed as an open pit mining operator by the Department of Mines and Mineral Industries and must receive from the Land Reclama-

tion Board a permit for each separate operation. The application for such permits from the Land Reclamation Board shall include, among other things, detailed plans showing the manner, time, and distance for backfilling. It normally would consist of terrace or contour restoration. Terrace restoration may not be approved unless the steepest contour of the highwall shall be no greater than 45°. The restoration plan must include the manner in which the operator shall plant trees, shrubs, or grasses upon the land affected by open pit mining. The Department of Mines and Mineral Industries holds back $100 per acre of the bond money to assure that the planting is done in a workman-like fashion. The Department will release this bond when the planting has proven successful.

The Land Reclamation Board may allow deviation from these requirements in such cases as when the operator proposes a satisfactory plan to leave the last cut for development of a lake.

b. Issuance of Permits

If the proposed plans of drainage are satisfactory to the Sanitary Water Board, permits will be issued. One major consideration in determining whether a permit shall be issued is an evaluation of the operator's previous violation history. If the Board feels that past performance indicates an operator may not follow his plan of drainage, the Board may refuse to issue a permit.

The mine drainage permits issued by the Board are for the duration of the permittees' operations and do not require periodic renewal. The Board may amend, suspend, revoke, or cancel any permit allowing the permittee the right of appeal.

A permit is required prior to operation of the mine or construction of treatment facilities. Treatment facilities must be constructed prior to operation of the mine unless the operator can show that water pollution is not likely to occur immediately. In such an event, the operator may submit a construction schedule coordinated with the time he expects pollution to occur.

## C. Enforcement

The Bureau of Sanitary Engineering in the Health Department, and the Bureau of Conservation and Reclamation in the Department of Mines and Mineral Industries, are responsible for the enforcement of the Clean Streams Law. The latter is responsible for enforcement pertaining to bituminous strip mines, while the former is responsible for enforcement of all other aspects of the pollution control program.

In regard to penalties under the mine drainage sections of the law, any violators of the law or Regulations of the Sanitary

Water Board issued pursuant to such section is guilty of a misdemeanor and upon conviction shall be subject to a fine of not less than $100 nor more than $5,000 for each offense; and a further fine of $40 for each day the offense is continued, or imprisonment for a period of not more than one year, or both.

Usually the most effective enforcement actions that the Board takes is in suspending and revoking permits and denying permits for companies in violation or habitual violators. Such enforcement procedures are instituted against violators who cause pollution with mine drainage in the same manner that such action is taken against any other industrial polluter.

D. Field Inspections

All of the active mines under permit are inspected by the agents of the Sanitary Water Board. The frequency of inspections varies with the importance and complexity of the mining operation and/or treatment facilities but averages about two inspections per year.

## Control of Pollution from Abandoned Mines

A. Definition of an Abandoned Mine

In our every day practice, we consider a mine abandoned when there is little likelihood that under present economic conditions that the mine will be reopened. In making these determinations, we rely heavily upon information provided by the owner of the coal rights and the local mine inspectors.

Pennsylvania's bituminous coal mine act defines "abandoned workings" as excavations, either caved or sealed, that are deserted and in which further mining is not intended. In the case of strip mines, the Bituminous Coal Open Pit Mining Conservation Act defines an "abandoned" mine as an operation where no coal has been produced or overburden removed for a period of one year, verified by monthly reports submitted to the Department by the operator, and by inspections made by mine inspectors.

B. Abandoned Mine Inventories

The vast majority of the coal mining areas of Pennsylvania have been inventoried to determine the number and magnitude of discharges from abandoned mines. The majority of this work has been undertaken by the Federal Water Pollution Control Administration with participation by the staff of the Health Department. The inventories on the Monongahela River Basin are completed and the reports are appendices to this summary report.

C. Plans for Pollution Abatement

The Commonwealth is now undertaking more detailed studies on watersheds where the inventory studies have indicated significantly polluted streams. These studies involve four-season sampling so that hydrologic effects on pollution can be noted. Specific pollution abatement plans will be developed upon completion of these studies.

D. Funds Devoted to the Problem

It is estimated that approximately three-quarter of a million dollars has been spent by State and Federal agencies in conducting mine drainage source inventory studies.

In 1967, Pennsylvania's voters approved a $500 million land and water conservation bond issue of which $150 million will be devoted to abandoned mine drainage pollution abatement over a ten year period. The estimated expenditures for 1968 and 1969 are $13 and $17 million, respectively. Fifteen million dollars per year will be spent in the succeeding eight years. Thus far, 74 projects involving the design, construction, and operation of pollution abatement projects and facilities have been initiated; of these projects, 12 are in the Monogahela basin.

a. Stream Improvement

A recent cursory review of streams previously polluted by mine drainage from active mines has shown that at least 50 miles of primary receiving streams have been restored to good condition by the operation of new mine drainage treatment facilities. About 200 treatment facilities serving active mines have been placed in operation or are under construction since the amended law went into effect in 1966. It is expected that considerably more mileage of primary receiving streams will be improved upon completion of additional plants. We are certain that streams into which the receiving streams flow have also improved in quality, but no specific studies have been undertaken to show this.

b. Strip Mine Reclamation

Since January 1, 1964, about 32,000 acres of strip mine land has been restored by contour or terrace backfilling and planting of vegetation by operators under our Bituminous Coal Open Pit Mining Conservation Act. In addition, 300 acres of pre-1964 strip mine lands have been restored with State and Federal funds. An additional 240 acres are presently under contract to be reclaimed during the next year. Pennsylvania received the first two grants from the Appalachian Regional Commission to restore strip mines.

Research Activities

One area of mine drainage technology which has not been explored to any significant extent is that area dealing with determining the likelihood of pollution from deep mines after completion of the operation. As indicated previously, we presently review deep mine applications which include geologic structure and mine development maps in order to make technical judgments as to the possibility of pollution upon completion of mining. These judgments are based upon experience and observations in the field of mine drainage control and by the application of basic hydrologic and geologic concepts. We recognize that this technology has not yet been perfected and that there is a need for additional research in this field. Accordingly, we are initiating a research project to study further the pertinent parameters involved in determining the "sealability" of proposed mines. We are also applying for Federal research funds which would allow us to broaden the spectrum of our research project.

## WEST VIRGINIA

### Legal Authority to Control Pollution Caused by Mine Drainage

The Division of Water Resources, Department of Natural Resources has the responsibility and authority to control mine drainage pollution as specified in Chapter 20, Article 5A, of the Code of West Virginia, as amended. The current statute, which became effective July 1, 1969, specifies that:

It shall be unlawful for any person, unless he holds a permit therefor from the department, which is in full force and effect, to: Open, reopen, operate or abandon any mine, quarry or preparation plant or dispose of any refuse or industrial wastes or other wastes from any such mine or quarry or preparation plant: Provided, that the department's permit shall only be required wherever the aforementioned activities cause, may cause or might reasonably be expected to cause a discharge into or pollution of waters of the State. (Chapter 20, Art. 5A, Section 5 (a) (6) as amended). The statute further specifies that "Any person who causes pollution..... or who fails to apply for and obtain a permit.....or who fails to comply with any term or condition of such permit, shall be guilty of a misdemeanor, and, upon conviction thereof, shall be punished by a fine of not less than one hundred dollars nor more than one thousand dollars or by imprisonment for a period not exceeding six months, or by both such fine or imprisonment." Willful violation, as related to the foregoing, carries fines of up to ten thousand dollars and/or six months imprisonment. (Chap. 20, Art. 5A Section 19)

Water quality standards were adopted by the state to aid the Division of Water Resources in the implementation of its pollution abatement program. The standards were adopted by the Federal Government in May 1968, however, the iron and aluminum criteria, specifically related to mine drainage, were excepted. In August of 1970 the Water Resources Board amended Section 5 and removed from West Virginia Regulations, Section 5.03(a) dealing with iron and aluminum criteria from acid mine drainage. The new legislation, effective July 1, 1969, strengthens the Water Resources Board in its promulgation of rules and regulations; specifically in the setting of water quality standards. (Chap. 20, Art. 5A, Section 3a). The chief under the new statute now has emergency powers to abate pollution, provide the necessary means for establishing eminent domain and obtaining injunctive relief. As provided in earlier legislation the chief may appoint water quality monitors to serve throughout the state for the purpose of obtaining water samples in pollution abatement efforts.

Article 6, Chapter 20 of the code of West Virginia created within the Department of Natural Resources, a Division of Reclamation to administer all of the laws of the state relating to surface mining.

The same article further created a Reclamation Commission in the Department of Natural Resources with the Director of Natural Resources as Chairman, the Chief of the Division of Reclamation, and the Director of the Department of Mines. The Commission has the authority to:

(a) Promulgate reasonable rules and regulations, in accordance with the provisions of chapter twenty-nine-a of this code, to implement the provisions of this article;

(b) Make investigations or inspections necessary to insure compliance with the provisions of this article;

(c) Conduct hearings under provision of this article or rules and regulations adopted by the commission and for the purpose of any investigation or hearing, hereunder, the commission or any member thereof may administer oaths or affirmation, subpoena witnesses, compel their attendance, take evidence and require production of any books, papers, correspondence, memoranda, agreements, or other documents or records relevant or material to the inquiry;

(d) Order, through the director, the suspension of any permit for failure to comply with any of the provisions of this article or any rules and regulations adopted pursuant thereto;

(e) Order, through the director, a cease and desist order of any operation that is started without a permit as required by law;

(f) Appoint such advisory committees as may be of assistance to the commission in the development of programs and policies; and

(g) Review orders and decisions of the director.

## Responsibilities and Functions of State Agencies Involved in Mine Drainage Control

The Division of Water Resources acting mainly under 20-5A-5 has, in the past, required that all discharges from mines be covered by permits. Under the new statute this authority is expanded and the function of the state will be expanded accordingly to cover the opening, operating, and abandoning of coal mines throughout the state.

The Division of Reclamation shall administer all of the laws of this state relating to surface mining and subject to the approval of the Director of Natural Resources shall exercise all of the powers and perform all of the duties by law vested in and imposed upon said director in relation to said operations. The Division of Reclamation shall have within its jurisdiction and supervision all lands and areas of the state, mined or susceptible of being mined, for the removal of minerals and all other lands and areas of the state deforested, burned over, barren or otherwise denuded, unproductive and subject to soil erosion and waste. Included within such lands and areas shall be lands seared and denuded by chemical operations and processes, abandoned coal-mining areas, swamplands, lands and areas subject to flowage easements and backwaters from river locks and dams, and river, stream, lake and pond shore areas subject to soil erosion and waste. The jurisdiction and supervision exercised by the division shall be consistent with other provisions of this chapter, and the division shall cooperate with other offices and divisions of the department.

## Control of Pollution from Active and Proposed Mining Operations

Under the current status, the state has been entering into a more active part in requiring treatment of mine drainage. During the period from early 1960 to 1966, some effort was exerted to have the necessary facilities (mainly ponds) to avoid the "slugging" of streams with mine water. Under the new law, which went into effect July 1, 1969, the state is looking more toward preplanning to avoid pollution during mining and to aid in proper procedures in the abandoning and sealing of mines as soon as they are worked out. The Division of Water Resources has attempted to set up monthly inspection programs in its overall surveillance program, however, the funding of the agency will dictate the frequency of inspections and also which programs will be fully implemented.

There has recently been a more active program in the installation of treatment facilities, especially in the area of neutralization and aeration.

The Division of Reclamation attempts to prevent the development of drainage pollution from surface mines by requiring the proper mining procedures, such as segregation and burying of acid-forming materials. The division has the power to deny a permit, where it is believed that mining would seriously affect the environment and would be contrary to the public interest.

## Control of Pollution from Abandoned Mines

The state has no formal comprehensive program for dealing with drainage pollution from abandoned mines. The Division of Reclamation administers a special reclamation fund that has been described that provides for reclamation of unreclaimed surface mines that were abandoned prior to establishment of an effective surface mine program. This fund is not available for use in the case of underground mines; however, it may be used for matching purposes where a watershed abatement program is carried out.

Three abandoned-mine pollution control projects have been carried out by using the surface mine fund alone or in conjunction with special state funds obtained to deal with the underground mines in the area. These projects are:

Snowy Creek-Laurel Run: Project complete except for final sealing of boreholes, stream significantly recovered.

Middle Fork River: This project is a continuing state effort to drain and recover strip areas to avoid heavy slugging during heavy rains.

Shavers Fork: This project is also a state effort in mine sealing to reduce the pollution load to this marginal stream, a very slight acid increase could remove this stream from being a fish habitat. Results of almost two years of work not assessed as yet.

In addition to these, a drainage control project was initiated by FWPCA with significant state aid in the Roaring Creek-Grassy Run watershed.

Progress in Mine-Drainage Control

Significant progress has been made in recent years in the laws and programs for mine drainage pollution control. It is felt, for example, that adequate legal means are now available for controlling the opening, operation, and abandonment of all types of mines, quarries,preparation plants, and refuse disposal areas. Establishment of an effective program under this authority will reduce the amount of polluted drainage from active mines and, perhaps more importantly, will eventually allow control over the creation of new abandoned mine pollution sources.

Surface mine laws have been in effect since 1939, when West Virginia became the first state to pass such laws. Because of the length of time that surface mine laws have been in effect and because surface mining is inherently more easily regulated than is underground mining, the program for regulation of surface mining is becoming relatively well advanced. As has been discussed, the surface mine program also provides for a special fund to enable the reclamation of abandoned unreclaimed mines.

# WATER QUALITY STANDARDS

## GENERAL

The water quality standards for the Monongahela River Basin are comprised of the Maryland, Pennsylvania, and West Virginia submissions. The three main elements of the standards are:

1. The use to be made of a particular stretch of a river, lake, or coastal water, such as swimming, drinking water, industrial use, or a combination of these uses.
2. A scientific determination of the specific characteristics or criteria which would permit the appropriate uses agreed on by the State and the Federal Government. Limits on such pollutants as bacteria, toxic materials, and taste- and odor-producing substances in the water are set by the standards.
3. A step-by-step plan for construction by cities and industries of waste treatment facilities and use of other measures to meet the water quality requirements.

The use designations and specific criteria are discussed below. The plans for construction of mine drainage abatement measures pertaining to mine drainage for the Monongahela are included in the discussions of State programs.

## MARYLAND

The surface water quality of the Youghiogheny Basin have been extensively and intensively studied. The headwaters of the Youghiogheny River near Crellin are polluted by mine acid drainage, the bulk of which enters the tributaries, Snowy Creek and Laurel Run. These tributaries arise in West Virginia.

Deep Creek Lake quality generally meets the water quality standards for present and proposed uses of recreation and aquatic life propagation. Cherry Creek tributary pollutes the lake with mine acid drainage. A bacteriological survey of the lake in 1971 showed excellent recreational quality except for a few locations.

Generally the northern area of the Casselman Basin has a relatively good pH, while the southwestern, southern, and eastern areas are marginal to poor. Specifically, the poorest areas were the western drainage of the North Branch of the Casselman consisting mostly of the eastern slope of Negro Mountain, the extreme southern end of the South Branch of the Casselman, south of Browning Bear Hill, and Meadow Run.

### Water Use and Criteria Designations

Water Use categories pertinent to the Monongahela Basin are:

I. (not applicable).

II. Public or municipal water supply.

III. Water contact recreation.

IV. Propagation of fish, other aquatic life and wildlife.

V. Agricultural water supply.

VI. Industrial water supply.

A major portion of the waters of the state have present or probable future uses which can be protected by one of three sets of water quality standards, identified as standards for Group A, Group B, or Group C water uses. Groups B and C pertain to the Monongahela and are defined as:

| Group B Water Uses | Group C Water Uses |
|---|---|
| The following combinations of water uses are protected by one set of water quality criteria: | The following combinations of water uses are protected by one set of water quality criteria: |
| II, IV | IV |
| II, IV, V | IV, V |
| II, IV, VI | IV, VI |
| II, IV, V, VI | IV, V, VI |
| II, III, IV | III, IV |
| II, III, IV, V | III, IV, V |
| II, III, IV, VI | III, IV, VI |
| II, III, IV, V, VI | III, IV, V, VI |

The following use and criteria designations are from Water Resources Regulation 4.8, Article 7 and 8:

## Article 8

## Listing of Specific Water Use and Quality Criteria for Specified Waters or Water Zones

| Item No./ Water | Zone | Standards for Water Uses Indicated | Water Uses to be Protected |
|---|---|---|---|
| SECTION 8.01 - Garrett County | | | |
| 1. Youghiogheny R. & all tribs | Entire basin, except as follows: | Group C | III, IV (Trout), V |
| 2. Youghiogheny R. & all tribs | Md.-W. Va. Stateline to confluence with Little Youghiogheny R. Tribs: Headwaters to mouth.<br>A. Little Youghiogheny R. & tribs<br>B. Deep Creek & tribs<br>C. Herrington Cr-headwaters to Herrington Manor Rd (County Route #21) & tribs<br>(All other tribs or portions of tribs same as item 1) | B | II, III, IV (Trout), V |
| 3. Casselman R. & all tribs | Old U.S. #40 bridge to Md.-Pa. Stateline & all tribs except as follows: | C | III, IV (Trout), V |
| 4. Casselman R. & tribs | Headwaters to Old U.S. #40 bridge & Md. portions of Shade Run, Puzzley Run & Piney Cr | B | II, III, IV (Trout), V |

Applicable Water Quality Criteria

The only Maryland criterion pertinent to mine drainage pollution is pH. For Group A, B, and C Water Uses, the normal pH values for the waters of the zone, must not be less than 6.0 nor greater than 8.5, except where--and to the extent that--pH values outside this range occur naturally. Any deviation, other than natural, from the above requirements is to be evaluated for risk to the propagation of fish and other aquatic life by the Department of Game and Inland Fish for nontidal waters, and by the Department of Chesapeake Bay Affairs for tidal waters, and will be permitted or denied by the Department of Water Resources after consultation with the aforementioned agencies.

In addition, the waters of the State shall at all times be free from:

> Substances attributable to sewage, industrial waste, or other waste that will settle to form sludge deposits that are unsightly, putrescent or odorous to such degree as to create a nuisance, or that interfere directly or indirectly with water uses;
>
> Floating debris, oil, grease, scum, and other floating materials attributable to sewage, industrial waste, or other waste in amounts sufficient to be unsightly to such a degree as to create a nuisance, or that interfere directly or indirectly with water uses;

Materials attributable to sewage, industrial waste, or other waste which produce taste, odor, or change the existing color or other physical and chemical conditions in the receiving stream to such degree as to create a nuisance, or that interfere directly or indirectly with water uses; and

High-temperature, toxic, corrosive or other deleterious substances attributable to sewage, industrial waste, or other waste in concentrations or combinations which interfere directly or indirectly with water uses, or which are harmful to human, animal, plant or aquatic life.

## PENNSYLVANIA

The recommendations made by the conferees of the State-Federal Enforcement Conference for the Monongahela River constitute minimum requirements for the Commonwealth of Pennsylvania.

### Water Use and Criteria Designations

The designated water uses and water quality criteria for the Monongahela River Basin are presented in tabular form below.

## Designated Water Uses and Water Quality Criteria

### Monongahela River Basin

| Description of Waters | | | Exceptions to Standard Water Use List | Specific Criteria |
|---|---|---|---|---|
| Exhibit Zone No. | Name | Limits of Zone | | |
| 07.010 | Monongahela River | W.Va.-Pa. State Line to Mouth | Add 3.1 | Group B<br>Add h, k, and q |
| 07.020 | The basins of Monongahela River tributaries except Ninemile Run and Turtle Creek basins | Mouth of Monongahela River to the Youghiogheny River | Delete 2.1 | Group B; delete $e_1$; add $e_2$. |
| 07.030 | The basins of Monongahela River tributaries except Peters Creek and Mingo Creek basins | Youghiogheny River to Pigeon Creek | None | Group B |
| 07.103 | Ninemile Run basin | None | Delete 2.1; add 1.4 | Group B; delete $b_2$ and $e_1$; add $b_5$ and $e_2$. |
| 07.105 | Turtle Creek basin | None except Zones 07.105.01 and 07.105.14.13 | None | Group B |
| 07.105.01 | Turtle Creek basin | Source to but not including Brush Creek, and all tributaries named and unnamed. | Add 1.4 | Group B; delete $b_2$; add $b_5$. |

## Designated Water Uses and Water Quality Criteria

## Monongahela River Basin

(Cont'd)

| Description of Waters | | | Exceptions to Standard Water Use List | Specific Criteria |
|---|---|---|---|---|
| Exhibit Zone No. | Name | Limits of Zone | | |
| 07.105.14.13 | Brush Run basin | Source to mouth and all tributaries named and unnamed | Add 1.4 | Group B;<br>Delete $b_2$;<br>Add $b_5$ |
| 07.108.01 | Youghiogheny River | Indian Creek to Mouth | None | Group B |
| 07.108.02 | Youghiogheny River | Youghiogheny Dam to Indian Creek | Add 1.1 and 3.1 | Group A |
| 07.108.03 | Youghiogheny River | Md.-Pa. State Line to Youghiogheny Dam | Add 3.1 | Group B<br>Delete $d_2$;<br>Add $d_1$ |
| 07.108.04 | The basins of Youghiogheny River tributaries except Long Run, Sewickley Ck. and Cedar Ck. Basins | Mouth to Jacobs Creek | None | Group B |
| 07.108.11 | Long Run | | Add 1.4 | Group B;<br>Delete $b_2$;<br>Add $b_5$ |
| 07.108.15 | Sewickley Ck. basin | None except Zones 07.108.15.01 and 07.108.15.11 | None | Group B |
| 07.108.15.01 | Sewickley Ck. basin | Source to but not including Jacks Run and all tributaries named and unnamed | Add 1.1 | Group A |
| 07.108.15.11 | Little Sewickley Ck. Basin | None | Add 1.1 | Group A |
| 07.108.16 | Cedar Creek | None | Add 1.4 | Group B;<br>Delete $b_2$;<br>Add $b_5$ |

## Designated Water Uses and Water Quality Criteria

## Monongahela River Basin

(Cont.)

| Description of Waters | | | Exceptions to Standard Water Use List | Specific Criteria |
|---|---|---|---|---|
| Exhibit Zone No. | Name | Limits of Zone | | |
| 07.108.43 | Casselman River | Md.-Pa. State Line to Mouth | None | Group B |
| 07.108.43.24 | Big Piney Run | All Pennsylvania waters from source to Pa.-Md. state line | Add 1.1 | Group A |
| 07.109 | Peters Creek Basin | None | Add 1.4 | Group B; delete $b_2$; add $b_5$. |
| 07.116 | Mingo Creek Basin | None | Add 1.4 | Group B; delete $b_2$; add $b_5$. |
| 07.149 | Dunkard Creek | All Pennsylvania waters from W.Va. Pa. State line to mouth | None | Group B |
| 07.149.20 | Rudolf Run | Source to Pa.-W.Va. State line | Intermittent Stream. No uses | General Criteria |
| 07.149.21 | Roberts Run | Source to Pa.-W.Va. State line | None | Group B |
| 07.149.24 | Pennsylvania Fork of Dunkard Creek | All Pennsylvania waters from source to mouth | None | Group B |

## Designated Water Uses and Water Quality Criteria

## Mononghela River Basin

(Cont.)

| Description of Waters | | | Exceptions to Standard Water Use List | Specific Criteria |
|---|---|---|---|---|
| Exhibit Zone No. | Name | Limits of Zone | | |
| 07.150 | Cheat River | W.Va.-Pa. State line to mouth | Add 3.1 | Group B |
| 07.150.13 | Big Sandy Creek | Source to Pa.-W.Va. State line | Add 1.1 | Group A |
| 07.150.13.12 | Little Sandy Creek | Source to Pa.-W.Va. State line | Add 1.1 | Group A |
| 07.150.13.13.11 | Laurel Run | Source to Pa.-W.Va. State line | Add 1.1 | Group A |
| 07.151 | Crooked Run | All Pennsylvania waters from source to mouth. | Intermittent Stream. No uses. | General Criteria |

The water uses which are to be protected, and upon which the development of water quality criteria are based, are set forth below. Those preceded by (X) comprise the standard list of uses assigned to all waters and is altered in specific cases by deleting or adding the individual use which applies. Refer to Section 6 for Water Uses or Exceptions to Standard Water Use Life for specific assignments.

1.0 Aquatic Life

1.1 Cold Water Fishes - Maintenance and propagation of the family Salmonidae and fish food organisms.

(X) 1.2 Warm Water Fishes - Maintanance and propagation of fish food organisms and all families of fishes except Salmonidae.

1.3 Migratory Fishes - Passage, maintenance, and propagation of anadromous and catadromous fishes, and other fishes which ascend to flowing waters to complete their life cycle.

1.4 Trout (stocking only) - Warm water fishes and trout stocking.

2.0 Water Supply

(X) 2.1 Domestic Water Supply - Use by humans after conventional treatment, for drinking, culinary, and other purposes.

(X) 2.2 Industrial Water Supply - Use by industry for inclusion into products, for processing, and for cooling.

(X) 2.3 Livestock Water Supply - Use by livestock and poultry for drinking and cleansing.

(X) 2.4 Wildlife Water Supply - Use for waterfowl habitat and by wildlife for drinking and cleansing.

(X) 2.5 Irrigation Water Supply - Used to supplement precipitation for growing of crops.

3.0 Recreation

3.1 Boating - Power boating, sailboating, canoeing, and rowing for recreational purposes.

(X) 3.2 Fishing - Use of the water for the taking of fish by legal methods

(X) 3.3 Water Contact Sports - Use of the water for swimming & related activities.

(X) 3.4 Natural Area - Use of the water as an aesthetic setting to recreational pursuits.

(x) 3.5 Conservation Area - Waters used within and suitable for the maintenance of an area now or in the future to be kept in a relatively primitive condition.

4.0 Other

(X) 4.1 Power - Use of the water energy to generate power.

4.2 Navigation - Use of the water for the commercial transfer and transport of persons, animals, and goods.

(X) 4.3 Treated Waste Assimilation - Use of the water for the assimilation and transport of treated waste waters.

## Applicable Water Quality Criteria

Water quality criteria applicable to the waters of the Commonwealth shall be the general criteria set forth in Section 5 and the specific criteria selected from the standard list of criteria in Section b and assigned to Section 7 of Article 301, Sanitary Water Board Rules and Regulations, Commonwealth of Pennsylvania.

## General Criteria

The water shall not contain substances attributable to municipal, industrial, or other waste discharges in concentration or amounts sufficient to be inimical or harmful to the water uses to be protected or to human, animal, plant, or aquatic life. Specific substances to be controlled include, but are not limited to, floating debris, oil, scum, and other floating materials; toxic substances; substances that produce color, tastes, odors, or settle to form sludge deposits.

## Specific Criteria

Each of the waters for which specific criteria have been established is listed in Section 7. The references to specific criteria are keyed to the groups of criteria and to the standard list of specific criteria set forth below.

| Groups of Criteria | | | Standard List of Specific Criteria | |
|---|---|---|---|---|
| Group A | Group B | Criteria | Key | Limits |
| $a_1$ | $a_1$ | pH | $a_1$ | Not less than 6.0; not to exceed 8.5. |
| | | | $a_2$ | Not less than 6.5; not to exceed 8.5. |
| | | | $a_3$ | Not less than 7.0; not to exceed 9.0. |
| $c_1$ | $c_1$ | Iron | $c_1$ | Total iron; not to exceed 1.5 mg/l. |
| | | | $c_2$ | Dissolved iron; not to exceed 0.3 mg/l. |
| e | e | Dissolved Solids | e | Not to exceed 500 mg/l as a monthly average value; not to exceed 750 mg/l at any time. |
| | | Alkalinity | i | Not to exceed 24 at 60°C. |
| | | Total Manganese | k | Not to exceed 1.0 mg/l. |
| | | Sulfate | n | Not to exceed 250 mg/l or natural levels, whichever is greater. |

b - Dissolved Oxygen

$b_1$ - Minimum daily average 6.0 mg/l; No value less than 5.0 mg/l

$b_2$ - Minimum daily average 5.0 mg/l; No value less than 4.0 mg/l

$b_3$ - Minimum daily average not less than 5.0 mg/l, except during period 4/1-6/15 and 9/16-12/31, not less than 6.5 mg/l

$b_4$ - Minimum daily average not less than 3.5 mg/l, except during period 4/1-6/15 and 9/16-12/31, not less than 6.5 mg/l

$b_5$ - (Added December 20, 1967) For the period 2/15 to 7/31 of any year; no value less than 5.0 mg/l. For the remainder of the year; no value less than 4.0 mg/l

$b_6$ - (Added December 20, 1967) No value less than 7/0 mg/l

$b_7$ - (Added December 20, 1967) For lakes, ponds and impoundments only; no value less than 4.0 mg/l in the epilimnion

$b_8$ - (Added December 20, 1967) For lakes, ponds and impoundments only; no value less than 5.0 mg/l at any point

c - Iron

$c_1$ - Total iron - Not to exceed 1.5 mg/l

$c_2$ - Dissolved iron - Not to exceed 0.3 mg/l

d - Temperature

$d_1$ - (Amended July 17, 1968) Not to be increased by more than 5°F above natural temperatures nor to be increased above 58°F.

$d_2$ - Not to exceed 5°F rise above ambient temperature or a maximum of 87°F, whichever is less; not to be changed by more than 2°F during any one hour period.

$d_3$ - Not to exceed 5°F rise above natural temperature or a maximum of 86°F, whichever is less; not to be changed by more than 2°F during any one hour period.

$d_4$ - Not to exceed 93°F; not to be changed by more than 2°F; during any one hour period.

e - Dissolved Solids

$e_1$ - Not to exceed 500 mg/l as a monthly average value; not to exceed 750 mg/l at any time.

$e_2$ - Not to exceed 1,500 mg/l at any time.

f - Bacteria (Coliforms/100 ml)

$f_1$ - For the period 5/15-9/15 of any year; not to exceed 1,000/100 ml as an arithmetic average value; not to exceed 1,000/100 ml in more than two consecutive samples; not to exceed 2,400/100 ml in more than one sample.

For the period 9/16-5/14 of any year; not to exceed 5,000/100 ml as a monthly average value, nor to exceed this number in more than 20% of the samples collected during any month; nor to exceed 20,000/100 ml in more than 5% of the samples.

$f_2$ - Not to exceed 5,000/100 ml as a monthly average value; nor to exceed this number in more than 20% of the samples collected during any month; nor to exceed 20,000/100 ml in more than 5% of the sample.

$f_3$ - Not to exceed 5,000/100 ml as a monthly geometric mean.

g - Turbidity

$g_1$ - Not to exceed 30 units during the period 5/30-9/15, nor to exceed a monthly mean of 40 units or a maximum of 150 units during the remainder of the year.

$g_2$ - Maximum monthly mean 40 units, maximum value not to exceed 150 units.

h - Threshold Odor Number

Not to exceed 24 at 60°C.

i - Alkalinity

Not less than 20 mg/l

j - MBAS (Methylene Blue Active Substance)

$j_1$ - Not to exceed 0.5 mg/l

$j_2$ - Not to exceed 1.0 mg/l

k - Total Manganese

Not to exceed 1.0 mg/l

l - Fluoride

Not to exceed 1.0 mg/l

m - Cyanide

Not to exceed 0.025 mg/l

n - Sulfate

Not to exceed 250 mg/l or natural levels, whichever is greater.

o - Chlorides

$o_1$ - Not to exceed 150 mg/l

$o_2$ - Not to exceed 250 mg/l

p - (Amended June 19, 1968) Phosphate (total soluble as $PO_4$)

$p_1$ - Not to exceed 0.10 mg/l or natural levels, whichever is greater.

$p_2$ - Not to exceed 0.30 mg/l or natural levels, whichever is greater.

$p_3$ - Not to exceed 0.40 mg/l or natural levels, whichever is greater.

q - Phenol

Not to exceed .005 mg/l

r - (Added December 20, 1967) Color - Not to exceed 50 units.

s - (Amended June 19, 1968, August 21, 1968) Copper

$s_1$ - Not to exceed 0.02 mg/l

$s_2$ - Not to exceed 0.10 mg/l

t - (Amended June 19, 1968, August 21, 1968)

Zinc - Not to exceed 0.05 mg/l

**Groups of Criteria**

| CRITERIA | GROUP A | GROUP B |
|---|---|---|
| pH | $a_1$ | $a_1$ |
| Dissolved Oxygen | $b_1$ | $b_2$ |
| Iron | $c_1$ | $c_1$ |
| Temperature | $d_1$ | $d_2$ |
| Dissolved Solids | e | e |
| Bacteria | $f_1$ | $f_1$ |

**Standard List of Specific Criteria**

a - pH

$a_1$ - Not less than 6.0; not to exceed 8.5

$a_2$ - Not less than 6.5; not to exceed 8.5

$a_3$ - Not less than 7.0; not to exceed 9.0

## WEST VIRGINIA

### Water Use and Criteria Designations

Extracted from the water use section of Chapter 20-5 and 20-5A Series 1, General and Water Use Categories:

Category A: Water Contact Recreation: This category includes swimming, fishing, water skiing, and certain types of pleasure boating such as sailing in very small craft and small outboard motor boats.

Category B1: Water Supply, Public: This category is used to describe all waters used for public supplies. It does not include water for cooling.

Category B2: Water Supply, Industrial: This category is used to describe all waters used for industrial supplies. It does not include water for cooling.

Category B3: Water Supply, Agricultural: This category includes all water used for agriculture, includes irrigation, as well as livestock watering. It is understood that these waters would also be suitable for wildlife watering.

Category C: Propagation of Fish and Other Aquatic Life: This category is self-explanatory and does recognize the importance of other aquatic life in addition to fish.

Category D: Water Transport, Cooling and Power: This category includes commercial and pleasure vessel activity except those small craft included in Category A. Cooling water is that water used for industrial cooling. Power production in this definition is hydropower.

Category E: Treated Wastes Transport and Assimilation: This category includes water of such quality as to assure safe passage of fish.

## SECTION 13. WATER USES AND WATER QUALITY CRITERIA

13.01 The following criteria are established for the purpose of maintaining water quality in the Monongahela River and all its tributaries from the West Virginia-Pennsylvania State line to the confluence of the Tygart Valley and West Fork Rivers.

(a) Present Uses: A, B1, B2 (See Section 6.)

(b) Water Quality Criteria for Present Uses:

Based on a minimum flow of 345 cfs at Lock and Dam $8, main stem Monongahela River. On the tributaries of the Monongahela River the following stream quality standards are to apply at all times when flows are equal to or greater than the minimum mean 7-consecutive-day drought flow with a 10-year return frequency.

1. Dissolved Oxygen: Not less than 5 mg/l at any time.
2. pH: Values normal for the waters in the area in question, however, generally held between 6.0 and 8.5, except streams carrying significant quantities of acid mine drainage shall have a pH of not less than 5.5

3. Temperature: Not to exceed 87°F at any time during the months of May through November and not to exceed 73°F at any time during the months of December through April.
4. Threshold Odor: Threshold odor not to exceed a threshold odor number of 8 at 60°C as a daily average.
5. Toxic Substances: Not to exceed 1/10 of the 96-hour median tolerance limit.
6. Bacteria: The Coliform group is not to exceed 1,000 per 100 ml as a monthly average nor exceed this number in more than 20 percent of the samples examined during any month; nor exceed 2,400 per 100 ml on any day.
7. Radioactivity: Gross beta activity not to exceed 1,000 picocuries per liter (pCi/l) nor shall activity from dissolved strontium-90 exceed 10 pCi/l, nor shall activity from dissolved alpha emitters exceed 3 pCi/l.
8. Heavy Metals: Not to exceed the following:

| Constituents | Concentration mg/l |
|---|---|
| Arsenic | 0.01 |
| Barium | 0.50 |
| Cadmium | 0.01 |
| Chromium (Hexavalent) | 0.05 |
| Lead | 0.05 |
| Silver | 0.05 |

9. Other Compounds:

| Constituents | Concentration mg/l |
|---|---|
| Nitrates | 45 |
| Chlorides | 100 |
| Sulfates | 200 |
| Phenol | 0.001 |
| Cyanide | 0.025 |
| Fluoride | 1.0 |
| Selenium | 0.01 |

(c) Future Uses: A, B1, B2, B3, C, D, E (See Section 6)

(d) Water Quality Criteria:

Same as Present Uses as modified below.

1. Bacteria: The Coliform group is not to exceed 1,000 per 100 ml as a monthly average value, nor exceed this number in 20 percent of the samples examined during any month; nor exceed 2,400 per 100 ml on any day.

(e) In special cases, where the facts warrant, more stringent standards, or exceptions to the above standards, may be established in the individual case.

13.02 The following criteria are established for the purpose of maintaining water quality in the West Fork River and all its tributaries from its mouth to its headwaters. The following stream quality standards are to apply at all times when flows are equal to or greater than the minimum mean 7-consecutive-day drought flow with a 10-year return frequency.

(a) Present Uses: A, B1, B2, Bc, C, D, E (See Section 6.)

(b) Water Quality Criteria for Present Uses:

1. Dissolved Oxygen: Not less than 5 mg/l at any time.
2. pH: Values normal for the waters in the area in question, however, generally held between 6.0 and 8.5, except streams carrying significant quantities of acid mine drainage shall have a pH of not less than 5.5.
3. Temperature: Not to exceed 87°F at any time during the months of May through November and not to exceed 73°F at any time during the months of December through April.
4. Threshold Odor: Threshold odor not to exceed a threshold odor number of 8 at 60°C as a daily average.
5. Toxic Substances: Not to exceed 1/10 of the 96-hour median tolerance limit.
6. Bacteria: The Coliform group is not to exceed 1,000/100 ml as a monthly average value; nor exceed this number in more than 20 percent of the samples examined during any month; nor exceed 2,400 per 100 ml on any day.

7. Radioactivity: Gross beta activity not to exceed 1,000 picocuries per liter (pCi/l) nor shall activity from dissolved strontium-90 exceed 10 pCi/l, nor shall activity from dissolved alpha emitters exceed 3 pCi/l.

8. Heavy Metals: Not to exceed the following:

| Constituents | Concentration mg/l |
|---|---|
| Arsenic | 0.01 |
| Barium | 0.50 |
| Cadmium | 0.01 |
| Chromium (Hexavalent) | 0.05 |
| Lead | 0.05 |
| Silver | 0.05 |

9. Other Compounds:

| Constituents | Concentration mg/l |
|---|---|
| Nitrates | 45 |
| Chlorides | 100 |
| Sulfates | 200 |
| Phenol | 0.001 |
| Cyanide | 0.025 |
| Fluoride | 1.0 |
| Selenium | 0.01 |

(c) Future Uses: A, B1, B2, B3, C, D, E (See Section 6.)

(d) Water Quality Criteria: Same as for Present Uses.

(e) In special cases, where the fact warrants, more stringent standards, or exceptions to the above standards, may be established in the individual case.

13.03 The following criteria are established for the purpose of maintaining water quality in the Tygart Valley River and all its tributaries from its mouth to its headwaters. The following stream quality standards are to apply at all times when flows are equal to or greater than the minimum mean 7-consecutive-day drought flow with a 10-year return frequency.

(a) Present Uses: A, B1, B2, B3, C, D, E (See Section 6.)

(b) Water Quality Criteria for Present Uses:

1. Dissolved Oxygen: Not less than 5 mg/l at any time.
2. pH: Values normal for the waters in the area in question, however, generally held between 6.0 and 8.5, except streams carrying significant quantities of acid mine drainage shall have a pH of not less than 5.5.
3. Temperature: Not to exceed 87°F at any time during the months of May through November and not to exceed 73°F at any time during the months of December through April.
4. Threshold Odor: Threshold odor not to exceed a threshold odor number of 8 as a daily average.
5. Toxic Substances: Not to exceed 1/10 of the 96-hour median tolerance limit.

6. Bacteria: The Coliform group is not to exceed 1,000/100 ml as a monthly average value; nor exceed this number in more than 20 percent of the samples examined during any month; nor exceed 2,400 per 100 ml on any day.

7. Radioactivity: Gross beta activity not to exceed 1,000 picocuries per liter (pCi/l); nor shall activity from dissolved strontium-90 exceed 10 pCi/l; nor shall activity from dissolved alpha emitters exceed 3 pCi/l.

8. Heavy Metals: Not to exceed the following:

| Constituents | Concentration mg/l |
|---|---|
| Arsenic | 0.01 |
| Barium | 0.50 |
| Cadmium | 0.01 |
| Chromium (Hexavalent) | 0.05 |
| Lead | 0.05 |
| Silver | 0.05 |

9. Other Compounds:

| Constituents | Concentration mg/l |
|---|---|
| Nitrates | 45 |
| Chlorides | 100 |
| Sulfates | 200 |
| Phenol | 0.001 |
| Cyanide | 0.025 |
| Fluoride | 1.0 |
| Selenium | 0.01 |

(c) Future Uses: A, B1, B2, B3, C, D, E, (See Section 6)

(d) Water Quality Criteria: Same as for Present Uses.

(e) In special cases, where the facts warrant, more stringent standards, or exceptions to the above standards, may be established in the individual case.

13.04 The following criteria are established for the purpose of maintaining water quality in the Cheat River and all its tributaries from the West Virginia-Pennsylvania State line to its headwaters. The following stream quality standards are to apply at all times when flows are equal to or greater than the minimum mean 7-consecutive-day drought flow with a 10-year return frequency.

(a) Present Uses: A, B1, B2, B3, C, D, E (See Section 6.)

(b) Water Quality Criteria for Present Uses:

1. Dissolved Oxygen: Not less than 5 mg/l at any time.
2. pH: Values normal for the waters in the area in question, however, generally held between 6.0 and 8.5, except streams carrying significant quantities of acid mine drainage shall have a pH of not less than 5.5.
3. Temperature: Not to exceed 87°F at any time during the months of May through November and not to exceed 73°F at any time during the months of December through April.
4. Threshold Odor: Threshold odor not to exceed a threshold odor number of 8 at 60°C as a daily average.
5. Toxic Substances: Not to exceed 1/10 of the 96-hour median tolerance limit.

6. Bacteria: The Coliform group is not to exceed 1,000/100 ml as a monthly average value; nor exceed this number in more than 20 percent of the samples examined during any month; nor exceed 2,400 per 100 ml on any day.

7. Radioactivity: Gross beta activity not to exceed 1,000 picocuries per liter (pCi/l) nor shall activity from dissolved strontium-90 exceed 10 pCi/l, nor shall activity from dissolved alpha emitters exceed 3 pCi/l.

8. Heavy Metals: Not to exceed the following:

| Constituents | Concentration mg/l |
|---|---|
| Arsenic | 0.01 |
| Barium | 0.50 |
| Cadmium | 0.01 |
| Chromium (Hexavalent) | 0.05 |
| Lead | 0.05 |
| Silver | 0.05 |

9. Other Compounds:

| Constituents | Concentration mg/l |
|---|---|
| Nitrates | 45 |
| Chlorides | 100 |
| Sulfates | 200 |
| Phenol | 0.001 |
| Cyanide | 0.025 |
| Fluoride | 1.0 |
| Selenium | 0.01 |

(c) Future Uses: A, B1, B2, B3, C, D, E (See Section 6.)

(d) Water Quality Criteria: Same as for Present Uses.

(e) In special cases where the facts warrant, more stringent standards, or exceptions to the above standards, may be established in the individual case.

13.05 The following criteria are established for the purpose of maintaining water quality in those tributaries of the Youghiogheny River in West Virginia which are interstate with Maryland. The following stream quality standards are to apply at all times when flows are equal to or greater than the minimum mean 7-consecutive-day drought flow with a 10-year return frequency.

(a) Present Uses: B1, E (See Section 6.)

(b) Water Quality Criteria for Present Uses:

1. Dissolved Oxygen: Not less than 5 mg/l at any time.
2. pH: Values normal for the waters in the area in question, however, generally held between 6.0 and 8.5, except streams carrying significant quantities of acid mine drainage shall have a pH of not less than 5.5.
3. Temperature: Not to exceed 87°F at any time during the months of May through November and not to exceed 73°F at any time durint the months of December through April.

4. Threshold Odor: Threshold odor not to exceed a threshold odor number of 8 at 60°C as a daily average.

5. Toxic Substances: Not to exceed 1/10 of the 96-hour median tolerance limit.

6. Bacteria: The Coliform group is not to exceed 5,000 per 100 ml as a monthly average nor exceed this number in more than 20 percent of the samples examined during the month; nor exceed 20,000 per 100 ml in more than 5 percent of the samples.

7. Radioactivity: Gross beta activity not to exceed 1,000 picocuries per liter (pCi/l) nor shall activity from dissolved strontium-90 exceed 10 pCi/l, nor shall activity from dissolved alpha emitters exceed 3 pCi/l.

8. Heavy Metals: Not to exceed the following:

| Constituents | Concentration mg/l |
|---|---|
| Arsenic | 0.01 |
| Barium | 0.50 |
| Cadmium | 0.01 |
| Chromium (Hexavalent) | 0.05 |
| Lead | 0.05 |
| Silver | 0.05 |

9. Other Compounds:

| Constituents | Concentration mg/l |
|---|---|
| Nitrates | 45 |
| Chlorides | 100 |
| Sulfates | 200 |
| Phenol | 0.001 |
| Cyanide | 0.025 |
| Fluoride | 1.0 |
| Selenium | 0.01 |

(c) Future Uses: B1, E (See Section 6.)

(d) Water Quality Criteria: Same as for Present Uses.

(e) In special cases where the facts warrant, more stringent standards, or exceptions to the above standards, may be established in the individual case.

# ATTACHMENT A

# TO

# MONONGAHELA RIVER

# MINE DRAINAGE

# SUMMARY REPORT

## SUB-BASIN SUMMARIES

# SUB-BASIN NO. 1

## LOWER MONONGAHELA

The Lower Monongahela sub-basin drains an area of 316 square miles that begins at Brownsville, Pennsylvania and ends at the confluence of the Allegheny and Monongahela Rivers at Pittsburgh. All the drainage area north of the Monongahela River from McKeesport, Pennsylvania to Pittsburgh is excluded from this sub-basin. A total of 55.1 river miles of the Monongahela River are within the sub-basin.

The only important commercial coal in the sub-basin is the Pittsburgh coal, although the Redstone coal is sometimes mined in combination with the Pittsburgh coal. Historically, mining was limited to drift and strip operations near streams where the Pittsburgh coal seam cropped out. Today, most mining activity is deep mines in the Pittsburgh seam and the mines are located in the southern part of the sub-basin, west of the Monongahela River.

A total of 232 draining sites were located within the lower Monongahela sub-basin during the field inventory. These mines contributed 12,400 lb/day of net acid to the drainage system; the major portion of the net acid load (7,676 lb/day) came from inactive underground mines.

Over 170 miles of streams were found to be affected by mine drainage in this sub-basin, including all 55 miles of the river mainstem within the sub-basin.

Recommended control measures for this sub-basin are five lime neutralization plants to treat a net acid load of 14,887 lb/day and reclamation of 22 acres of refuse.

SUB-BASIN 1 TOTAL NO. OF SITES 545 TOTAL NET ACID lbs/day 12.400 TOTAL IRON lbs/day 9.069

| | | Drift | Strip | Shaft and/or Slope | Strip & Drift | Strip & Auger | Prep. Plant | Refuse Pile | Total |
|---|---|---|---|---|---|---|---|---|---|
| **ACTIVE SITES** | | | | | | | | | |
| **No. of Sites** | **Dry** | 5 | 5 | 2 | 1 | - | 2 | - | 15 |
| | **Draining** | 6 | 1 | 2 | 2 | - | 2 | - | 13 |
| | **Total** | 11 | 6 | 4 | 3 | - | 4 | - | 28 |
| **Load** | **Net Acid** | -2,264 | -0 | 1,184 | -24 | - | 54 | - | -1,050 |
| | **Total Iron** | 1,183 | 0 | 2,396 | 5 | - | 7 | - | 3,591 |
| **INACTIVE SITES** | | | | | | | | | |
| **No. of Sites** | **Dry** | 136 | 124 | 23 | 14 | - | 1 | - | 298 |
| | **Draining** | 151 | 32 | 1 | 34 | - | - | 1 | 219 |
| | **Total** | 287 | 156 | 24 | 48 | - | 1 | 1 | 517 |
| **Load** | **Net Acid** | 7,883 | 4,332 | -207 | 1,440 | - | - | 2 | 13,450 |
| | **Total Iron** | 5,045 | 358 | 4 | 71 | - | - | 0 | 5,478 |
| **TOTAL SITES** | | | | | | | | | |
| **No. of Sites** | **Dry** | 141 | 129 | 25 | 15 | - | 3 | - | 313 |
| | **Draining** | 157 | 33 | 3 | 36 | - | 2 | 1 | 232 |
| | **Total** | 298 | 162 | 28 | 51 | - | 5 | 1 | 545 |
| **Load** | **Net Acid** | 5,619 | 4,332 | 977 | 1,416 | - | 54 | 2 | 12,400 |
| | **Total Iron** | 6,228 | 358 | 2,400 | 76 | - | 7 | 0 | 9,069 |

## SUB-BASIN NO. 2

### REDSTONE CREEK AND DUNLAP CREEK

Redstone and Dunlap Creeks drain a 151 square mile area. The streams run northwest parallel to one another and both enter the Monongahela River at Brownsville, Pennsylvania.

The seven minable coal seams that occur in the area are the Waynesburg, Sewickley, Redstone, and Pittsburg seams of the Monongahela group and the Upper Freeport, Lower Kittanning and Brookville-Clarion of the Allegheny Group. The Monongahela Group coals are nearly mined-out. When deeper mining becomes economical the Allegheny Formation coals, which underlie virtually the entire sub-basin, will be mined.

A total of 130 inactive mines and five active mines were inventoried. There were 1,174 acres of unreclaimed surface-mined land. Only 17 inactive mines and three active mines were discharging drainage. Three inactive shaft mines discharged 90 percent of the acid load.

Over 99 miles of streams, more than 40 percent of the streams in the area, were affected by mine drainage. Near the mouth of the Redstone Creek, the pH ranged from 3.2 to 6.6, and the stream contained as much as 2,320 mg/l of sulfate and 51.5 mg/l of iron.

It is judged that reclamation of 180 acres of surface mines and 505 acres of refuse piles will reduce pollution of contributions from surface sources. However, treatment of the drainage from the three inactive shaft mines is the principal need. One lime neutralization treatment plant with a 10-ton net acid per day capacity is recommended.

SUB-BASIN 2 TOTAL NO. OF SITES 135 TOTAL NET ACID lbs/day 21,203 TOTAL IRON lbs/day 18,352

| | | Drift | Strip | Shaft and/or Slope | Strip & Drift | Strip & Auger | Prep. Plant | Refuse Pile | Total |
|---|---|---|---|---|---|---|---|---|---|
| **ACTIVE SITES** | | | | | | | | | |
| No. of Sites | Dry | - | 1 | - | 1 | - | - | - | 2 |
| | Draining | - | 3 | - | - | - | - | - | 3 |
| | Total | - | 4 | - | 1 | - | - | - | 5 |
| Load | Net Acid | - | 1,857 | - | - | - | - | - | 1,857 |
| | Total Iron | - | 284 | - | - | - | - | - | 284 |
| **INACTIVE SITES** | | | | | | | | | |
| No. of Sites | Dry | 15 | 54 | 31 | 10 | - | - | 3 | 113 |
| | Draining | 3 | 8 | 3 | 3 | - | - | - | 17 |
| | Total | 18 | 62 | 34 | 13 | - | - | 3 | 130 |
| Load | Net Acid | -3 | 27 | 19,320 | 2 | - | - | - | 19,346 |
| | Total Iron | 2 | 3 | 18,060 | 3 | - | - | - | 18,068 |
| **TOTAL SITES** | | | | | | | | | |
| No. of Sites | Dry | 15 | 55 | 31 | 11 | - | - | 3 | 115 |
| | Draining | 3 | 11 | 3 | 3 | - | - | - | 20 |
| | Total | 18 | 66 | 34 | 14 | - | - | 3 | 135 |
| Load | Net Acid | -3 | 1,884 | 19,320 | 2 | - | - | - | 21,203 |
| | Total Iron | 2 | 287 | 18,060 | 3 | - | - | - | 18,352 |

## SUB-BASIN NO. 3

### TENMILE CREEK, PENNSYLVANIA

The Tenmile Creek sub-basin includes the Tenmile Creek and South Fork Tenmile Creek drainages and encompasses 338 square miles containing 507 miles of streams. Tenmile Creek flows eastward through Washington County and enters the Monongahela River at Millsboro. The South Fork drainage lies entirely in Greene County, the County boundary coinciding with the drainage divide between Tenmile Creek and the South Fork.

Minable coal seams crop out only in the eastern part of the sub-basin, where the Monongahela Group coals are exposed. The Pittsburgh coal is the most important; the Sewickley and Waynesburg coals are also mined. Mining has been in the eastern one-third of the basin, where the coals are nearest the surface, but reserves underlie the remainder of the area and will eventually be deep-mined. All coal mining to date has been by underground methods.

Fifty-three discharging mines were inventoried, but the significant discharge sources were eight active shaft and drift mines.

Water quality in the South Fork Tenmile Creek was virtually unaffected by mine drainage upstream from sample station 1353 (Figure 2). Results from biological studies in 1965 indicated the presence of mine drainage pollution in the Lower South Fork and in Tenmile Creek, but these studies were made before implementation of controls over active mine sources.

The active mine sources are subject to control under the Pennsylvania Clean Streams Act. The only drainage sources judged to require remedial attention are abandoned refuse piles that occupy a total of 52 acres.

SUB-BASIN 3
TOTAL NO. OF SITES 96
TOTAL NET ACID lbs/day - 838
TOTAL IRON lbs/day 2,094

| | | Drift | Strip | Shaft and/or Slope | Strip & Drift | Strip & Auger | Prep. Plant | Refuse Pile | Total |
|---|---|---|---|---|---|---|---|---|---|
| **ACTIVE SITES** | | | | | | | | | |
| No. of Sites | Dry | - | - | 3 | - | - | - | - | 3 |
| | Draining | 6 | - | 2 | - | - | 2 | - | 10 |
| | Total | 6 | - | 5 | - | - | 2 | - | 13 |
| Load | Net Acid | 131 | - | - 1019 | - | - | 41 | - | - 847 |
| | Total Iron | 1,855 | - | 177 | - | - | 0 | - | 2,032 |
| **INACTIVE SITES** | | | | | | | | | |
| No. of Sites | Dry | 36 | - | 3 | - | - | 1 | - | 40 |
| | Draining | 43 | - | - | - | - | - | - | 43 |
| | Total | 79 | - | 3 | - | - | 1 | - | 83 |
| Load | Net Acid | 9 | - | - | - | - | - | - | 9 |
| | Total Iron | 62 | - | - | - | - | - | - | 62 |
| **TOTAL SITES** | | | | | | | | | |
| No of Sites | Dry | 36 | - | 6 | - | - | 1 | - | 43 |
| | Draining | 49 | - | 2 | - | - | 2 | - | 53 |
| | Total | 85 | - | 8 | - | - | 3 | - | 96 |
| Load | Net Acid | 140 | - | - 1019 | - | - | 41 | - | - 838 |
| | Total Iron | 1,917 | - | 177 | - | - | - | - | 2,094 |

## SUB-BASIN NO. 4

### MIDDLE MONONGAHELA

The Middle Monongahela sub-basin drains an area of 264 square miles that begins at the mouth of the Cheat River and terminates at Brownsville, Pennsylvania, a distance of 33.2 river miles. Watersheds tributary to this reach of river but excluded from the sub-basin are: Dunkard Creek, Tenmile Creek, Dunlap Creek, and Redstone Creek.

Presently, the Pittsburgh coal is the only important commercial coal in this area, although the Waynesburg, Sewickley, and Redstone coals are mined for local use. In the early part of the Twentieth Century, mining activity centered on drift mining east of the Monongahela River. Today, mining activity is centered on deep mines in the western half of the sub-basin, where there are considerable reserves of the Pittsburgh coal.

A total of 298 sites were inventored in the area and 125 of these were found to be draining. These mines contributed a net acid load of 50,434 lbs/day to the watershed. Most of the acid load came from active and inactive strip-drift operations located east of the river. Mines in this sub-basin discharged a total of 16,428 lbs/day of iron.

Several drainage areas in the sub-basin were severely polluted by acid mine drainage, especially the streams east of the river in the southern part of the sub-basin. York Run, Georges Creek, Jacobs Creek and Browns Run received most of the acid discharged in the sub-basin. The balance of the tributaries to the Monongahela River in this sub-basin were not affected seriously by acid mine drainage.

Remedial measures needed to reduce the acid load in this sub-basin would include the control of discharges from active mines, reclamation of 370 acres of strip mines, the reclamation of 64 acres of refuse, the sealing of 87 abandoned drift mine openings, and construction of approximately 1,500 feet of diversion ditches.

SUB-BASIN 4 TOTAL NO. OF SITES 298 TOTAL NET ACID lbs/day 50,434 TOTAL IRON lbs/day 16,428

|  |  | Drift | Strip | Shaft and/or Slope | Strip & Drift | Strip & Auger | Prep. Plant | Refuse Pile | Total |
|---|---|---|---|---|---|---|---|---|---|
| **ACTIVE SITES** |  |  |  |  |  |  |  |  |  |
| No. of Sites | Dry | 2 | 5 | 2 | 1 | - | 4 | - | 14 |
|  | Draining | 3 | 1 | 6 | 9 | - | 6 | - | 25 |
|  | Total | 5 | 6 | 8 | 10 | - | 10 | - | 39 |
| Load | Net Acid | 742 | 100 | -15,949 | 27,878 | - | 1,261 | - | 14,032 |
|  | Total Iron | 74 | 51 | 7,784 | 4,506 | - | 172 | - | 12,587 |
| **INACTIVE SITES** |  |  |  |  |  |  |  |  |  |
| No. of Sites | Dry | 81 | 51 | 18 | 6 | - | 2 | - | 159 |
|  | Draining | 50 | 18 | 3 | 29 | - | - | - | 100 |
|  | Total | 131 | 69 | 21 | 35 | - | 2 | 1 | 259 |
| Load | Net Acid | 4,035 | 13,498 | -1,204 | 20,073 | - | - | - | 36,402 |
|  | Total Iron | 1,218 | 767 | 8 | 1,848 | - | - | - | 3,841 |
| **TOTAL SITES** |  |  |  |  |  |  |  |  |  |
| No. of Sites | Dry | 83 | 56 | 20 | 7 | - | 6 | 1 | 173 |
|  | Draining | 53 | 19 | 9 | 38 | - | 6 | - | 125 |
|  | Total | 136 | 75 | 29 | 45 | - | 12 | 1 | 298 |
| Load | Net Acid | 4,777 | 13,598 | -17,153 | 47,951 | - | 1,261 | - | 50,434 |
|  | Total Iron | 1,292 | 818 | 7,792 | 6,354 | - | 172 | - | 16,428 |

## SUB-BASIN NO. 5

### DUNKARD CREEK

Dunkard Creek is about 42 miles long, flows eastward, meanders across the West Virginia-Pennsylvania State line, and enters the Monongahela River just downstream from Point Marion. The watershed drains 234 square miles and has an estimated 350 miles of streams.

Five seams of coal of economic importance are in the basin. These are: the Washington coal of the Dunkard Group and the Waynesburg, Sewickley, Redstone, and Pittsburgh coals of the Monongahela Group. The coals occur in outcrops that follow the stream banks along Dunkard Creek and its tributaries upstream to about the Pennsylvania-West Virginia State line and dip increasingly farther beneath the surface to the west. Mining has been by shallow drift mining and strip mining in the eastern part of the watershed; the mines become increasingly deeper as they follow the coal beds westward.

A total of 88 underground mines and 31 strip mines were inventoried. Inactive mines contributed about 73 percent of the net acid load.

Water quality in the upper Dunkard Creek watershed was unaffected by mine drainage. The quality of lower Dunkard Creek was found to be severely degraded by mine drainage at times and pH values as low as 3.1 were measured.

Twenty-seven percent of the net acid drainage inventoried originated in active mines, which are subject to State regulations. That portion of the drainage originating in inactive mines can, at least partly be controlled by surface reclamation, mine sealing, and other source control methods. Reclamation of 54 acres of surface mines, 15 acres of refuse, and 5 acres of subsidence, in addition to 45 mine seals, are recommended to control pollution from inactive sites in this area.

SUB-BASIN 5 TOTAL NO. OF SITES 119 TOTAL NET ACID lbs/day 10,994 TOTAL IRON lbs/day 4,506

| | | Drift | Strip | Shaft and/or Slope | Strip & Drift | Strip & Auger | Prep. Plant | Refuse Pile | Total |
|---|---|---|---|---|---|---|---|---|---|
| **ACTIVE SITES** | | | | | | | | | |
| No. of Sites | Dry | 6 | 1 | 1 | - | - | - | - | 8 |
| | Draining | 5 | - | 3 | - | - | - | - | 8 |
| | Total | 11 | 1 | 4 | - | - | - | - | 16 |
| Load | Net Acid | 1,810 | - | 1,180 | - | - | - | - | 2,990 |
| | Total Iron | 524 | - | 1,884 | - | - | - | - | 2,408 |
| **INACTIVE SITES** | | | | | | | | | |
| No. of Sites | Dry | 56 | 25 | - | - | - | - | - | 81 |
| | Draining | 17 | 5 | - | - | - | - | - | 22 |
| | Total | 73 | 30 | - | - | - | - | - | 103 |
| Load | Net Acid | 7,344 | 660 | - | - | - | - | - | 8,004 |
| | Total Iron | 1,929 | 169 | - | - | - | - | - | 2,098 |
| **TOTAL SITES** | | | | | | | | | |
| No. of Sites | Dry | 62 | 26 | 1 | - | - | - | - | 89 |
| | Draining | 22 | 5 | 3 | - | - | - | - | 30 |
| | Total | 84 | 31 | 4 | - | - | - | - | 119 |
| Load | Net Acid | 9,154 | 660 | 1,180 | - | - | - | - | 10,994 |
| | Total Iron | 2,453 | 169 | 1,884 | - | - | - | - | 4,506 |

## SUB-BASIN NO. 6

### UPPER MONONGAHELA RIVER

This sub-basin encompasses 293 square miles and includes 43 miles of the mainstem of the Monongahela from its origin at Fairmont to its confluence with Dunkard Creek in Pennsylvania.

Twenty-three coals crop out in the sub-basin. Three coals have been extensively mined, including the Upper Freeport, the Pittsburgh, and the Sewickley. Commercial mining dates back to the middle 1800's, and production from the area has been large. The readily accessible reserves have been nearly exhausted and present extraction is by deep shaft mining.

A total of 604 sites were inventoried, 195 of which were draining. Active mines were found to contribute 76 percent of the net acid load at the time of the survey. Inactive drift and strip mines were found to be the source of most of the remaining pollutants.

A total of 180 miles of streams were found to be degraded during the survey; this included the entire 43 miles of the Monongahela River within the sub-basin.

Neutralization and treatment of drainage from active mines would remove most of the net acid load measured in this sub-basin during the study. Remedial measures recommended for inactive mines include reclamation of 173 acres of strip-mined land and 145 acres of refuse piles and control of drainage from 150 underground mine openings.

SUB-BASIN 6 TOTAL NO. OF SITES 604 TOTAL NET ACID lbs/day 233,453 TOTAL IRON lbs/day 64,844

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| | | Drift | Strip | Shaft and/or Slope | Strip & Drift | Strip & Auger | Prep. Plant | Refuse Pile | Total |
|---|---|---|---|---|---|---|---|---|---|
| ACTIVE SITES | | | | | | | | | |
| No. of Sites | Dry | 17 | 7 | 1 | - | 1 | 3 | | 29 |
| | Draining | 15 | 4 | 1 | 1 | 1 | 4 | | 26 |
| | Total | 32 | 11 | 2 | 1 | 2 | 7 | | 55 |
| Load | Net Acid | 151,681 | 410 | 17,680 | 729 | -4 | -35 | | 170,461 |
| | Total Iron | 41,195 | 41 | 6,027 | 147 | 0 | 241 | | 47,651 |
| INACTIVE SITES | | | | | | | | | |
| No. of Sites | Dry | 177 | 155 | 2 | 42 | 1 | 3 | - | 380 |
| | Draining | 94 | 38 | - | 34 | 2 | - | 1 | 169 |
| | Total | 271 | 193 | 2 | 76 | 3 | 3 | 1 | 549 |
| Load | Net Acid | 38,291 | 5,663 | - | 18,714 | 5 | - | 319 | 62,992 |
| | Total Iron | 11,271 | 1,156 | - | 4,661 | 2 | - | 103 | 17,193 |
| TOTAL SITES | | | | | | | | | |
| No. of Sites | Dry | 194 | 162 | 3 | 42 | 2 | 6 | - | 409 |
| | Draining | 109 | 42 | 1 | 35 | 3 | 4 | 1 | 195 |
| | Total | 303 | 204 | 4 | 77 | 5 | 10 | 1 | 604 |
| Load | Net Acid | 189,972 | 6,073 | 17,680 | 19,443 | 1 | -35 | 319 | 233,453 |
| | Total Iron | 52,466 | 1,197 | 6,027 | 4,808 | 2 | 241 | 103 | 64,844 |

## SUB-BASIN NO. 7

### BUFFALO CREEK AND PAW PAW CREEK

The Buffalo and Paw Paw Creeks sub-basin drains 173 square miles. Buffalo Creek heads at the Wetzel-Marion County line and flows eastward about 30 miles to the Monongahela River. Paw Paw Creek flows southeastward some 14 miles across Marion County and enters the Monongahela River about three miles downstream from Fairmont.

Only coals of the Monongahela Group have been mined, including the Waynesburg, Sewickley, and Pittsburgh seams. The Redstone coal, which lies between the Sewickley and Pittsburgh, generally is not of minable thickness. The Monongahela Group is exposed along the valleys in the eastern half of the sub-basin, but dips westward beneath the younger Dunkard Group in the western half. Early in the mining history of the area, many small drift mines existed. However, the more economically important Pittsburgh and Sewickley coals are far enough beneath the surface in much of the area to require shaft mining methods. There has been a small amount of surface mining.

Forty-eight mines and 5 coal preparation plants were inventoried.

Mine drainage was affecting about 42 miles of streams during the inventory. The pollution could be controlled by requiring the mine operators to control or treat their mine water.

SUB-BASIN 7 TOTAL NO. OF SITES 53 TOTAL NET ACID lbs/day 12 TOTAL IRON lbs/day 934

| | | Drift | Strip | Shaft and/or Slope | Strip & Drift | Strip & Auger | Prep. Plant | Refuse Pile | Total |
|---|---|---|---|---|---|---|---|---|---|
| ACTIVE SITES | | | | | | | | | |
| No. of Sites | Dry | 1 | - | - | - | - | - | - | 1 |
| | Draining | - | 6 | - | - | - | 5 | - | 11 |
| | Total | 1 | 6 | - | - | - | 5 | - | 12 |
| Load | Net Acid | - | - 7 | - | - | - | 6 | - | - 1 |
| | Total Iron | - | 877 | - | - | - | 55 | - | 932 |
| INACTIVE SITES | | | | | | | | | |
| No. of Sites | Dry | 32 | 4 | 3 | - | - | - | - | 39 |
| | Draining | 2 | - | - | - | - | - | - | 2 |
| | Total | 34 | 4 | 3 | - | - | - | - | 41 |
| Load | Net Acid | 13 | - | - | - | - | - | - | 13 |
| | Total Iron | 2 | - | - | - | - | - | - | 2 |
| TOTAL SITES | | | | | | | | | |
| No. of Sites | Dry | 33 | 4 | 3 | - | - | - | - | 40 |
| | Draining | 2 | 6 | | - | - | 5 | - | 13 |
| | Total | 35 | 10 | 3 | - | - | 5 | - | 53 |
| Load | Net Acid | 13 | - 7 | - | - | - | 6 | - | 12 |
| | Total Iron | 2 | 877 | - | - | - | 55 | - | 934 |

## SUB-BASIN NO. 8

### LOWER WEST FORK RIVER

The Lower West Fork River sub-basin is an area of 250 square miles, which includes the West Fork River and most of its tributary drainage from Clarksburg to Fairmont. The excluded tributary is Tenmile Creek, which is described in a separate report.

The four coal seams of the Monongahela Group, including in descending order the Waynesburg, Sewickley, Redstone, and Pittsburgh coals, have been mined in the sub-basin. Because the important coal beds are extensively exposed on both sides of the West Fork River, scores of drift mines have been opened. Strip mining of the out crop has been extensive also. To the west, shaft mines have been opened to reach the coal seams which dip westward beneath the younger Dunkard Group.

More than 1,425 openings to underground mines were located. Strip mines had disturbed 3,690 acres, but only 600 acres were judged as reclaimed. Refuse piles, most still in use, covered 350 acres. Inactive mines contributed about 78 percent of the total net acid load and active mines 22 percent.

More than 45 percent of the streams within the area or 171 miles of tributary streams and the main stem of the West Fork were found to be degraded by mine drainage. Water quality data from sample station 1303 revealed that the pH value ranged from pH 2.8 to pH 6.2, but only 4 of 30 samples had a value above pH 4.0.

The preliminary surveys indicate that pollution control at inactive sites would require the following major at-source controls:

| | |
|---|---|
| Drainage Diversion | 2300 feet |
| Surface Mine Reclamation | 603 acres |
| Refuse Pile Reclamation | 112 acres |
| Mine Sealing | 789 seals |
| Reforestation | 22 acres |

Other measures, including treatment, would probably be required to achieve the desired level of abatement.

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SUB-BASIN 3 TOTAL NO. OF SITES 783 TOTAL NET ACID lbs/day 201,195 TOTAL IRON lbs/day 48,029

| | | Drift | Strip | Shaft and/or Slope | Strip & Drift | Strip & Auger | Prep. Plant | Refuse Pile | Total |
|---|---|---|---|---|---|---|---|---|---|
| **ACTIVE SITES** | | | | | | | | | |
| No. of Sites | Dry | 7 | 12 | - | - | 2 | 5 | - | 26 |
| | Draining | 19 | 1 | 3 | - | - | 3 | 1 | 27 |
| | Total | 26 | 13 | 3 | - | 2 | 8 | 1 | 53 |
| Load | Net Acid | 41,316 | 0 | 3,262 | - | - | 426 | 0 | 45,004 |
| | Total Iron | 9,035 | 0 | 901 | - | - | 274 | 0 | 10,210 |
| **INACTIVE SITES** | | | | | | | | | |
| No. of Sites | Dry | 132 | 204 | 9 | 2 | 2 | 4 | 2 | 355 |
| | Draining | 231 | 120 | 2 | 17 | 4 | 1 | - | 375 |
| | Total | 363 | 324 | 11 | 19 | 6 | 5 | 2 | 730 |
| Load | Net Acid | 120,901 | 24,654 | -478 | 10,188 | 904 | 22 | - | 156,191 |
| | Total Iron | 29,291 | 6,270 | 48 | 2,117 | 86 | 7 | - | 37,819 |
| **TOTAL SITES** | | | | | | | | | |
| No. of Sites | Dry | 139 | 216 | 9 | 2 | 4 | 9 | 2 | 381 |
| | Draining | 250 | 121 | 5 | 17 | 4 | 4 | 1 | 402 |
| | Total | 389 | 337 | 14 | 19 | 8 | 13 | 3 | 783 |
| Load | Net Acid | 162,217 | 24,654 | 2,784 | 10,188 | 904 | 448 | 0 | 201,195 |
| | Total Iron | 38,326 | 6,270 | 949 | 2,117 | 86 | 281 | 0 | 48,029 |

## SUB-BASIN NO. 9

### TENMILE CREEK, WEST VIRGINIA

Tenmile Creek is tributary to the West Fork River, flows northeastward and enters the West Fork River between Clarksburg and Fairmont. The sub-basin encompasses 125 square miles.

Only the Pittsburgh coal has been commercially mined in the sub-basin. It is exposed at the surface in the eastern portion of the area and dips beneath the surface toward the west. It has been mined extensively by drift and surface mining methods, but only six mines were active during the inventory, and all were underground operations.

A total of 107 sites were inventoried. Inactive drift mines were found to discharge most of the net acid load (86 percent) during the study.

More than 37 miles of stream in the Tenmile Creek drainage were found to be affected by mine drainage. Because mining had been concentrated in the lower part of the drainage basin, the headwaters were unaffected. Values of pH ranging from pH 2.9 to pH 6.5 were measured at sample station 1330. An average of 50 tons/day (336 mg/l) of hardness were carried by Tenmile Creek at this point.

Control of drainage from the inactive underground sources would be the key effort in an abatement program. The initial survey indicates that at least 59 openings will require control measures.

Reclamation of 47 acres of surface mined land and 31 acres of refuse piles will be required. Active mine operators will be required to control or treat mine waters from their operations.

SUB-BASIN 9 TOTAL NO. OF SITES 107 TOTAL NET ACID lbs/day 8,945 TOTAL IRON lbs/day 4,185

| | | Drift | Strip | Shaft and/or Slope | Strip & Drift | Strip & Auger | Prep. Plant | Refuse Pile | Total |
|---|---|---|---|---|---|---|---|---|---|
| **ACTIVE SITES** | | | | | | | | | |
| No. | Dry | - | - | - | - | - | - | - | - |
| of | Draining | 5 | - | 1 | - | - | 1 | - | 7 |
| Sites | Total | 5 | - | 1 | - | - | 1 | - | 7 |
| Load | Net Acid | 1,262 | - | -103 | - | - | 98 | - | 1,257 |
| | Total Iron | 713 | - | 502 | - | - | 15 | - | 1,230 |
| **INACTIVE SITES** | | | | | | | | | |
| No. | Dry | 9 | 30 | - | - | 0 | 4 | - | 43 |
| of | Draining | 31 | 23 | - | 2 | 1 | - | - | 57 |
| Sites | Total | 40 | 53 | - | 2 | 1 | 4 | - | 100 |
| Load | Net Acid | 6,012 | 1,591 | - | -3 | 88 | - | - | 7,688 |
| | Total Iron | 2,194 | 712 | - | 26 | 23 | - | - | 2,955 |
| **TOTAL SITES** | | | | | | | | | |
| No. | Dry | 9 | 30 | - | - | | 4 | - | 43 |
| of | Draining | 36 | 23 | 1 | 2 | 1 | 1 | - | 64 |
| Sites | Total | 45 | 53 | 1 | 2 | 1 | 5 | - | 107 |
| Load | Net Acid | 7,274 | 1,591 | -103 | -3 | 88 | 98 | - | 8,945 |
| | Total Iron | 2,907 | 712 | 502 | 26 | 23 | 15 | - | 4,185 |

## SUB-BASIN NO. 10

### ELK CREEK

The Elk Creek sub-basin includes 121 square miles and lies east of the West Fork River. Elk Creek enters the West Fork at Clarksburg.

The Pittsburgh and Redstone coals of the Monongahela Group are the only two coals commercially mined in the area. These coals are present at the surface in the lower part of the drainage and in the headwaters, but have been eroded away in the central one-third of the drainage area. Mining is by drift and surface methods. The coal-bearing beds cap the hills, and contour strip mines ring the hillsides and often cut into the drift mine workings.

A total of 217 mines were inventoried which included 103 drift and 114 surface mines. Many of the drift mines had been intercepted by strip and auger mines. Inactive drift mines were the principal pollution source, but all types of mines in the area, including active mines, contributed significantly to the problem.

At least 96 miles or 53 percent of the miles of streams within the area were found to be affected by mine drainage. Over 18 tons per day of net acid were entering these streams. Analysis of samples from stream station 1308, just upstream from Clarksburg, showed a range of pH values from 2.4 to 6.3, but 20 of 26 samples exhibited a pH value of less than 4.0. An average of 60 tons per day of hardness and as much as 3 tons per day of iron was carried by Elk Creek at this location.

The study showed need to control drainage from at least 113 openings to inactive drift mines, reclaim 398 acres of inactive surface mines and 41 acres of refuse piles, and control drainage from active mines.

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SUB-BASIN 10 TOTAL NO. OF SITES 217 TOTAL NET ACID lbs/day 36,086 TOTAL IRON lbs/day 12,586

| | | Drift | Strip | Shaft and/or Slope | Strip & Drift | Strip & Auger | Prep. Plant | Refuse Pile | Total |
|---|---|---|---|---|---|---|---|---|---|
| **ACTIVE SITES** | | | | | | | | | |
| No. | Dry | 10 | 8 | - | - | - | - | - | 18 |
| of | Draining | 9 | 4 | - | - | 4 | - | - | 17 |
| Sites | Total | 19 | 12 | - | - | 4 | - | - | 35 |
| Load | Net Acid | 8,130 | 13 | - | - | 1,469 | - | - | 9,612 |
| | Total Iron | 3,148 | 29 | - | - | 1,270 | - | - | 4,447 |
| **INACTIVE SITES** | | | | | | | | | |
| No. | Dry | 37 | 48 | - | 1 | 4 | - | - | 90 |
| of | Draining | 47 | 22 | - | 6 | 17 | - | - | 92 |
| Sites | Total | 84 | 70 | - | 7 | 21 | - | - | 182 |
| Load | Net Acid | 15,343 | 3,662 | - | 459 | 6,510 | - | - | 26,474 |
| | Total Iron | 5,324 | 751 | - | 212 | 1,852 | - | - | 8,139 |
| **TOTAL SITES** | | | | | | | | | |
| No. | Dry | 47 | 56 | - | 1 | 4 | - | - | 108 |
| of | Draining | 56 | 26 | - | 6 | 21 | - | - | 109 |
| Sites | Total | 103 | 82 | - | 7 | 25 | - | - | 217 |
| Load | Net Acid | 23,473 | 3,675 | - | 459 | 7,979 | - | - | 36,086 |
| | Total Iron | 8,472 | 780 | - | 212 | 3,122 | - | - | 12,586 |

## SUB-BASIN NO. 11

### UPPER WEST FORK RIVER

The Upper West Fork River sub-basin includes an area of 386 square miles. The West Fork River. which originates in the sub-basin, is 102 miles long, 71 miles of which is upstream from Clarksburg and within this sub-basin.

The Redstone and Pittsburgh coals of the Monongahela Group and the Elk Lick and Bakerstown coals of the Conemaugh Group are the minable coals of the sub-basin. The Pittsburgh and Redstone coals are the significant coals while the Elk Lick and Bakerstown coals are of minor importance. Rocks of the Monongahela Group cap the hills throughout much of the area, and very frequently, the central portion of the hilltops have first been drift mined and the out crops later strip and auger mined, so that the surface mines cut into and expose the underground mine workings. Thus, where there were originally only a few openings to an underground mine, there may now be many.

Some 471 sites and an estimated 3,700 acres of strip-mined land were investigated during the study. A total of 224 draining sites were located. Active sites contributed about 51 percent of the net acid load, although there were only 10 such sites with drainage. Inactive underground mines contributed about 21 percent of the net acid and active underground mines, inactive strip mines and combination mines accounted for the remaining 28 percent.

A total of 146 miles of streams, about 25 percent of the total streams in the sub-basin, were found to be degraded by mine drainage. Very few miles of streams in the upstream one-half of the drainage area are degraded, but virtually all of the streams in the reach from the Harrison County border to Clarksburg are severely degraded.

The results of the study indicate a need to control drainage from at least 195 openings to inactive underground drift mines, to reclaim 1,450 acres of strip-mined land and 80 acres of refuse piles. Heavy subsidence has been found along Browns Creek and several other tributaries. Nearly 50 acres of subsided land will require remedial work. At-source control of drainage from inactive mines will be complex in this area because of the extent to which surface and above drainage drift mines are interconnected.

SUB-BASIN 11 TOTAL NO. OF SITES 471 TOTAL NET ACID lbs/day 3,539 TOTAL IRON lbs/day 2,115

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| | | Drift | Strip | Shaft and/or Slope | Strip & Drift | Strip & Auger | Prep. Plant | Refuse Pile | Total |
|---|---|---|---|---|---|---|---|---|---|
| **ACTIVE SITES** | | | | | | | | | |
| No. of Sites | Dry | 4 | 4 | - | 1 | 1 | - | - | 10 |
| | Draining | 5 | 1 | - | 1 | 2 | 1 | - | 10 |
| | Total | 9 | 5 | - | 2 | 3 | 1 | - | 20 |
| Load | Net Acid | 952 | 6 | - | 2 | -21 | 3,435 | - | 4,374 |
| | Total Iron | 238 | 1 | - | 0 | 5 | 1,067 | - | 1,311 |
| **INACTIVE SITES** | | | | | | | | | |
| No. of Sites | Dry | 107 | 115 | - | 9 | 2 | 4 | - | 237 |
| | Draining | 86 | 104 | - | 8 | 11 | 3 | 2 | 214 |
| | Total | 193 | 219 | - | 17 | 13 | 7 | 2 | 451 |
| Load | Net Acid | 1,828 | 1,266 | - | 281 | 321 | 434 | 35 | 4,165 |
| | Total Iron | 378 | 161 | - | 203 | 24 | 34 | 4 | 804 |
| **TOTAL SITES** | | | | | | | | | |
| No. of Sites | Dry | 111 | 119 | - | 10 | 3 | 4 | - | 247 |
| | Draining | 91 | 105 | - | 9 | 13 | 4 | 2 | 224 |
| | Total | 202 | 224 | - | 19 | 16 | 8 | 2 | 471 |
| Load | Net Acid | 2,780 | 1,272 | - | 283 | 300 | 3,869 | 35 | 8,539 |
| | Total Iron | 616 | 162 | - | 203 | 29 | 1,101 | 4 | 2,115 |

## SUB-BASIN NO. 12

### LOWER TYGART VALLEY RIVER

The Lower Tygart Valley River sub-basin drains 191 square miles and includes all drainage to the Tygart Valley River from Tygart Lake dam downstream 23 miles to Fairmont.

Coals of the Monongahela, Conemaugh, Allegheny, and Pottsville Groups crop out in the sub-basin. Minable coals are present in each of these rock units, but no mines were inventoried in coals of the Pottsville Group. Early mining was entirely by drift mining, but surface mining has been important since the 1940's. At the time of the field study, 28 sites were active. The major reserves of minable coal are in the upper Freeport coal of the Allegheny Group.

A total of 285 sites were inventoried in the lower Tygart Valley River sub-basin. Of these, 171 were underground mines, 92 were strip mines, and 21 combination drift and strip mines. Inactive drift mines were found to be the principal net acid source and discharged about 49 percent of the total load within the sub-basin. As shown in the table of drainage sources, each of the other source types contributed to the problem. The major source areas are the headwaters of Threefork Creek and three tributaries downstream from Grafton.

A total of 123 miles of stream, or about 43 percent of the total stream length, is affected by mine drainage. The pH values of water samples taken downstream from Tygart Lake and upstream from Threefork Creek, ranged from 4.1 to 5.4. Biological studies showed that no aquatic organisms were present immediately downstream from Threefork Creek, but that there was some quality improvement downstream toward Grafton. This was consistent with the source inventory finding discussed above.

This study showed a need to control drainage from 287 mine openings. Surface reclamation will be needed on 255 acres of mined land and on 3 acres of refuse piles. Extensive drainage diversion will be required on 4,000 feet of highwall and streams. Reforestation is recommended for 35 acres of barren surface mine land.

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SUB-BASIN 12 TOTAL NO. OF SITES 285 TOTAL NET ACID lbs/day 65,902 TOTAL IRON lbs/day 13,477

| | | Drift | Strip | Shaft and/or Slope | Strip & Drift | Strip & Auger | Prep. Plant | Refuse Pile | Total |
|---|---|---|---|---|---|---|---|---|---|
| ACTIVE SITES | | | | | | | | | |
| No. of Sites | Dry | 9 | - | - | - | - | - | - | 9 |
| | Draining | 13 | 2 | - | 3 | - | 1 | - | 19 |
| | Total | 22 | 2 | - | 3 | - | 1 | - | 28 |
| Load | Net Acid | 5,728 | 3,176 | - | 7,788 | - | 230 | - | 16,922 |
| | Total Iron | 1,264 | 548 | - | 816 | - | 54 | - | 2,682 |
| INACTIVE SITES | | | | | | | | | |
| No. of Sites | Dry | 52 | 35 | 1 | 2 | 1 | - | - | 91 |
| | Draining | 96 | 54 | - | 16 | - | - | - | 166 |
| | Total | 148 | 89 | 1 | 18 | 1 | - | - | 257 |
| Load | Net Acid | 32,225 | 8,513 | - | 8,242 | - | - | - | 48,980 |
| | Total Iron | 7,730 | 1,658 | - | 1,407 | - | - | - | 10,795 |
| TOTAL SITES | | | | | | | | | |
| No. of Sites | Dry | 61 | 35 | 1 | 2 | 1 | - | - | 100 |
| | Draining | 109 | 56 | - | 19 | - | 1 | - | 185 |
| | Total | 170 | 91 | 1 | 21 | 1 | 1 | - | 285 |
| Load | Net Acid | 37,953 | 11,689 | - | 16,030 | - | 230 | - | 65,902 |
| | Total Iron | 8,994 | 2,206 | - | 2,223 | - | 54 | - | 13,477 |

## SUB-BASIN NO. 13

### MIDDLE TYGART VALLEY RIVER

The Middle Tygart Valley River sub-basin includes the drainage to the 36-mile portion of the river that extends from the community of Belington to the Tygart Lake dam, near Grafton. The area covers 313 square miles and contains about 470 miles of streams.

Ten coals have been mined in the area, but only the Upper Freeport, Upper Kittanning, and Lower Kittanning are currently being mined. Older mines were mainly small drift mines. More recent mining has been primarily strip mining.

A total of 146 draining sites were located. Inactive drift mines were the principal drainage pollution source. Inactive strip mines and preparation plants were also important contributors.

About 140 miles of streams, or 30 percent of the total, are degraded by mine drainage, which includes the entire 55 miles of the Tygart Valley River that is within the sub-basin.

Remedial measures to control pollution from inactive sites include reclamation of 505 acres of surface-mined land and 11 acres of refuse piles and control of drainage from 107 underground openings.

SUB-BASIN 13 TOTAL NO. OF SITES 314 TOTAL NET ACID lbs/day 8,061 TOTAL IRON lbs/day 1,195

| | | Drift | Strip | Shaft and/or Slope | Strip & Drift | Strip & Auger | Prep. Plant | Refuse Pile | Total |
|---|---|---|---|---|---|---|---|---|---|
| **ACTIVE SITES** | | | | | | | | | |
| No. | Dry | 5 | 4 | - | - | - | - | - | 9 |
| of | Draining | 3 | 4 | - | - | - | 1 | - | 8 |
| Sites | Total | 8 | 8 | - | - | - | 1 | - | 17 |
| Load | Net Acid | 329 | 26 | - | - | - | 1,003 | - | 1,358 |
| | Total Iron | 34 | 5 | - | - | - | 269 | - | 308 |
| **INACTIVE SITES** | | | | | | | | | |
| No. | Dry | 117 | 35 | - | 5 | - | 2 | - | 159 |
| of | Draining | 102 | 31 | - | 5 | - | - | - | 138 |
| Sites | Total | 219 | 66 | - | 10 | - | 2 | - | 297 |
| Load | Net Acid | 4,252 | 1,597 | - | 854 | - | - | - | 6,703 |
| | Total Iron | 676 | 119 | - | 92 | - | - | - | 887 |
| **TOTAL SITES** | | | | | | | | | |
| No. | Dry | 122 | 39 | - | 5 | - | 2 | - | 168 |
| of | Draining | 105 | 35 | - | 5 | - | 1 | - | 146 |
| Sites | Total | 227 | 74 | - | 10 | - | 3 | - | 314 |
| Load | Net Acid | 4,581 | 1,623 | - | 854 | - | 1,003 | - | 8,062 |
| | Total Iron | 710 | 124 | - | 92 | - | 269 | - | 1,195 |

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## SUB-BASIN NO. 14

### BUCKHANNON RIVER

The Buckhannon River is tributary to the Tygart Valley River, which, in turn, joins the West Fork River. The entire drainage of the 45-mile-long Buckhannon River is within the sub-basin. The watershed contains 309 square miles and has about 465 miles of streams.

Twelve coals have been mined in the area; of these the Redstone, Pittsburgh, Upper Freeport, and Lower Kittanning coals were the principal beds mined. Most of the coal has been extracted through drifts. Surface mining has been in the area northwest of Buckhannon, along the drainage of the Left Fork, and in the headwaters area along Beech Run and Dry Run.

A total of 513 sites were located and 268 of these were draining. Inactive drift mines were found to be the principal pollution source, but as shown by the table of mine drainage sources, active and inactive sources of all types contributed pollutants.

Sixty-four miles of streams were judged to be significantly degraded during the study. The Left Fork was the first tributary that contributed appreciable pollution to the Buckhannon River, and all of the other severely degraded streams were west of the main stream and downstream from the Left Fork.

Estimates of remedial work required to reduce pollution from inactive mines includes reclamation of 660 acres of surface mined land and 110 acres of refuse piles, sealing of 75 acres of subsided land, and control of drainage from more than 200 underground mine openings. In addition, 9,100 feet of diversion ditches are recommended.

SUB-BASIN 14 TOTAL NO. OF SITES 513 TOTAL NET ACID lbs/day 3,229 TOTAL IRON lbs/day 1,191

| | | Drift | Strip | Shaft and/or Slope | Strip & Drift | Strip & Auger | Prep. Plant | Refuse Pile | Total |
|---|---|---|---|---|---|---|---|---|---|
| **ACTIVE SITES** | | | | | | | | | |
| No. | Dry | 9 | 2 | - | - | - | 1 | - | 12 |
| of | Draining | 13 | 1 | - | 1 | 1 | 2 | - | 18 |
| Sites | Total | 22 | 3 | - | 1 | 1 | 3 | - | 30 |
| Load | Net Acid | -1,147 | 7 | - | 3 | 0 | 273 | - | -864 |
| | Total Iron | 425 | 0 | - | 1 | 0 | 40 | - | 466 |
| **INACTIVE SITES** | | | | | | | | | |
| No. | Dry | 163 | 54 | - | 11 | | 5 | - | 233 |
| of | Draining | 192 | 31 | - | 24 | | 1 | 2 | 250 |
| Sites | Total | 355 | 85 | - | 35 | | 6 | 2 | 483 |
| Load | Net Acid | 1,911 | 519 | - | 227 | | 588 | 848 | 4,093 |
| | Total Iron | 408 | 43 | - | 52 | | 72 | 150 | 725 |
| **TOTAL SITES** | | | | | | | | | |
| No. | Dry | 172 | 56 | - | 11 | - | 6 | - | 245 |
| of | Draining | 205 | 32 | - | 25 | 1 | 3 | 2 | 268 |
| Sites | Total | 377 | 88 | - | 36 | 1 | 9 | 2 | 513 |
| Load | Net Acid | 764 | 526 | - | 230 | 0 | 861 | 848 | 3,229 |
| | Total Iron | 833 | 43 | - | 53 | 0 | 112 | 150 | 1,191 |

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## SUB-BASIN NO. 15

### MIDDLE FORK RIVER

The Middle Fork River is a tributary to the Tygart Valley River in north-central West Virginia. It drains an area of 151 square miles and is about 38 miles in length.

Bedrock of the Conemaugh, Pottsville, and Allegheny Groups crop out in the sub-basin. Minable coals are present in each of these rock units, but no mines were inventoried in coals of the Conemaugh Group. Early mining was entirely by drift mining, but a small amount of surface mining has occurred in recent years. At the time of the field inventory, there were seven active mining operations within the sub-basin. The coal with the reserve of greatest potential for future development is the Sewell coal of the Pottsville Group.

A total of 71 underground mine sites and 250 acres of land disturbed by surface mining were inventoried in the Middle Fork River sub-basin. A net acid load of 1,192 lbs/day was discharged from 67 of the inventoried sources. As the table of drainage sources indicates, active surface mines were found to be the principal source of net acidity. These sources discharged more than 85 percent of the total acid. The major source area of the sub-basin was the area upstream from the community of Cassity.

A total of about 19 miles of streams was considered to be affected by mine drainage in this area. The pH value of stream samples taken at Audra ranged from 3.9 to 7.0. Biological study results showed that the Middle Fork River is obviously affected by mine drainage in its headwaters area, but that biological recovery occurs in the lower reach of the river. Fishkills have occurred in the stream and were attributed to the effects of acid mine drainage.

Results from the present study show the need to control drainage from 60 underground mine openings and 150 acres of land disturbed by strip mining.

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SUB-BASIN 15 TOTAL NO. OF SITES 82 TOTAL NET ACID lbs/day 1,192 TOTAL IRON lbs/day 113

| | | Drift | Strip | Shaft and/or Slope | Strip & Drift | Strip & Auger | Prep. Plant | Refuse Pile | Total |
|---|---|---|---|---|---|---|---|---|---|
| **ACTIVE SITES** | | | | | | | | | |
| No. of Sites | Dry | 1 | | - | - | - | - | - | 1 |
| | Draining | 5 | 1 | - | - | - | - | - | 6 |
| | Total | 6 | 1 | - | - | - | - | - | 7 |
| Load | Net Acid | -12 | 1019 | - | - | - | - | - | 1007 |
| | Total Iron | 1 | 101 | - | - | - | - | - | 102 |
| **INACTIVE SITES** | | | | | | | | | |
| No. of Sites | Dry | 14 | - | - | - | - | - | - | 14 |
| | Draining | 51 | 7 | - | 3 | - | - | - | 61 |
| | Total | 65 | 7 | - | 3 | - | - | - | 75 |
| Load | Net Acid | 47 | 96 | - | 42 | - | - | - | 185 |
| | Total Iron | 2 | 4 | - | 5 | - | - | - | 11 |
| **TOTAL SITES** | | | | | | | | | |
| No. of Sites | Dry | 15 | - | - | - | - | - | - | 15 |
| | Draining | 56 | 8 | - | 3 | - | - | - | 67 |
| | Total | 71 | 8 | - | 3 | - | - | - | 82 |
| Load | Net Acid | 35 | 1,115 | - | 42 | - | - | - | 1,192 |
| | Total Iron | 3 | 105 | - | 5 | - | - | - | 113 |

## SUB-BASIN NO. 16

### UPPER TYGART VALLEY RIVER

The Upper Tygart Valley River sub-basin drains 347 square miles and includes all drainage to the Tygart Valley River upstream of the community of Belington, West Virginia. The length of the main stream in this study area is 75 miles.

Coals of the Conemaugh, Pottsville, and Allegheny Group are present in the sub-basin. Five coal seams have been mined. The Lower Kittanning coal is the only seam of present importance. Underground mining has been prevalent, strip mining is common, and auger mining is rare in the study area. The major reserves of minable coal are in the Lower Kittanning coal of the Allegheny Group.

The results of the field inventory indicate one active combination drift and strip mine, one active strip mine, one active slope mine, 38 inactive underground mines, and 360 acres left disturbed by surface mining existed in the area. These inventory totals are exclusive of mine drainage sources in the Roaring Creek-Grassy Run area in Randolph County which was the site of an acid mine drainage pollution control demonstration project. That area and the drainage, discussed in another report, were excluded from the inventory reported herein.

Inactive drift mines and inactive strip and drift combination mines were found to be the principal sources of acid and discharged about 77 percent of the total net acid load. Other source types were also significant acid contributors.

About 22 miles of streams in this sub-basin are affected by mine drainage. Stream samples from the Tygart Valley River at Belington had a pH range of 3.9-7.6 and the average acidity concentration was nearly balanced by the average alkalinity concentration.

The results from present study indicate the need to control drainage from 67 underground mine openings. Surface reclamation will be needed on 350 acres of strip-mined land and 18 acres of refuse piles. An estimated 102 acres of subsidence will require drainage control as well.

SUB-BASIN 16 TOTAL NO. OF SITES 68 TOTAL NET ACID lbs/day 7195 TOTAL IRON lbs/day 353

| | | Drift | Strip | Shaft and/or Slope | Strip & Drift | Strip & Auger | Prep. Plant | Refuse Pile | Total |
|---|---|---|---|---|---|---|---|---|---|
| ACTIVE SITES | | | | | | | | | |
| No. | Dry | - | - | - | - | - | - | - | - |
| of | Draining | - | 1 | 1 | 1 | - | - | - | 3 |
| Sites | Total | - | 1 | 1 | 1 | - | - | - | 3 |
| Load | Net Acid | - | 0 | 5 | 6 | - | - | - | 11 |
| | Total Iron | - | 0 | 0 | 1 | - | - | - | 1 |
| INACTIVE SITES | | | | | | | | | |
| No. | Dry | 19 | 7 | - | - | - | 1 | - | 27 |
| of | Draining | 19 | 12 | - | 6 | 1 | - | - | 38 |
| Sites | Total | 38 | 19 | - | 6 | 1 | 1 | - | 65 |
| Load | Net Acid | 3,089 | 1,579 | - | 2,487 | 29 | - | - | 7,184 |
| | Total Iron | 132 | 105 | - | 110 | 5 | - | - | 352 |
| TOTAL SITES | | | | | | | | | |
| No. | Dry | 19 | 7 | - | - | - | 1 | - | 27 |
| of | Draining | 19 | 13 | 1 | 7 | 1 | - | - | 41 |
| Sites | Total | 38 | 20 | 1 | 7 | 1 | 1 | - | 68 |
| Load | Net Acid | 3,089 | 1,579 | 5 | 2,493 | 29 | - | - | 7,195 |
| | Total Iron | 132 | 105 | - | 111 | 5 | - | - | 353 |

## SUB-BASIN NO. 17

### LEADING CREEK

The Leading Creek watershed is not underlain by coal-bearing strata, therefore, it had no coal mining activity or related mine drainage effects. This area is the only one of the 30 sub-basins in the Monongahela Basin that has no coal resources.

## SUB-BASIN NO. 18

### LOWER CHEAT RIVER

The Lower Cheat River sub-basin encompasses 170 square miles and includes the drainage to the 29-mile reach of the Cheat River between the community of Albright, West Virginia and the Monongahela River at Point Marion, Pennsylvania.

There are at least 14 minable coals exposed in this sub-basin. These coals are included in the Monongahela, Conemaugh, Pittsburgh, and Allegheny Groups. No mines were inventoried in coals of the Pottsville Group. Small farm drift mines were operated in the study area long before mining companies started. Large mines have always been difficult to establish due to the lack of accessibility and the steep dip of coal seams. An estimated 677 acres were disturbed by active strip mining and 191 openings to active underground mines were located during the survey. Minable coal reserves in the northwestern one-half of the sub-basin will be near depletion by 1970. Surface mining appears to be feasible for many years in the remainder of the area.

The sub-basin contained 14 active strip mines, 27 active drift mines, 7 active strip and drift combination mines, 125 inactive drift mines, 137 inactive strip mines and 31 inactive strip and drift combination mines. Inactive mines were found to be the principal source of acid and discharged about 80 percent of the total net acid load in the sub-basin. As the table of drainage sources indicates, each of the other source types contributed to the acid problem also. The major acid source areas were the watersheds of Muddy Creek and a number of smaller tributaries along the west bank between Albright and the Monongalia County line, and the small intensively mined area west of and downstream from Lake Lynn.

A total of 144 miles of streams was affected by mine drainage in this watershed. Stream samples taken from the Cheat River just below Lake Lynn exhibited a pH range from 3.2 to 6.7. Results from biological studies at three locations on the Cheat River indicated that primarily tolerant and very tolerant benthic organisms inhabit the reach of the stream from Albright to Point Marion.

The results of the study showed the need to control drainage from 195 underground mine openings and perform surface reclamation on about 145 acres of strip mine land and 37 acres of refuse piles.

SUB-BASIN 18 TOTAL NO. OF SITES 342 TOTAL NET ACID lbs/day 140,031 TOTAL IRON lbs/day 26,907

| | | Drift | Strip | Shaft and/or Slope | Strip & Drift | Strip & Auger | Prep. Plant | Refuse Pile | Total |
|---|---|---|---|---|---|---|---|---|---|
| **ACTIVE SITES** | | | | | | | | | |
| No. of Sites | Dry | 11 | 10 | - | 2 | 1 | - | - | 24 |
| | Draining | 16 | 3 | - | 5 | - | - | - | 24 |
| | Total | 27 | 13 | - | 7 | 1 | - | - | 48 |
| Load | Net Acid | 5,467 | 5,228 | - | 16,811 | - | - | - | 27,505 |
| | Total Iron | 1,079 | 1,560 | - | 2,254 | - | - | - | 4,893 |
| **INACTIVE SITES** | | | | | | | | | |
| No. of Sites | Dry | 54 | 104 | - | 12 | 2 | - | 1 | 173 |
| | Draining | 71 | 29 | - | 19 | 2 | - | - | 121 |
| | Total | 125 | 133 | - | 31 | 4 | - | 1 | 294 |
| Load | Net Acid | 65,965 | 2,281 | - | 44.260 | 19 | - | - | 112,525 |
| | Total Iron | 14,118 | 565 | - | 7,329 | 2 | - | - | 22,014 |
| **TOTAL SITES** | | | | | | | | | |
| No. of Sites | Dry | 65 | 114 | - | 14 | 3 | - | 1 | 197 |
| | Draining | 87 | 32 | - | 24 | 2 | - | - | 145 |
| | Total | 152 | 146 | - | 38 | 5 | - | 1 | 342 |
| Load | Net Acid | 71,432 | 7,509 | - | 61,071 | 19 | - | - | 140,031 |
| | Total Iron | 15,197 | 2,125 | - | 9,583 | 2 | - | - | 26,907 |

## SUB-BASIN NO. 19

### BIG SANDY CREEK

Big Sandy Creek drains 208 square miles in West Virginia, Pennsylvania, and a very small corner of Maryland. The stream is 30 miles in length and enters the Cheat River near the Monongalia-Preston County line.

Seven minable coal beds are present in the sub-basin, three in strata of the Conemaugh Group and four in the Allegheny Group. Coal mines were inventoried in each of the seven coal seams. Most of the mining activity has occurred in the Upper Freeport coal. Large scale underground mining has never developed in this area. Surface mining on a moderate scale has been conducted in this area for several years. At the time of the inventory, four strip mines and one drift mine were active. The Upper Freeport and Upper Kittanning seams are the coals of principal activity. Surface mining seems to be the most economical method to mine the thinner and rather inconsistent coals within this area. An increase in surface mining seems likely, especially in the unmined areas near the Pennsylvania-West Virginia State lines.

A total of 141 mines were inventoried in the sub-basin. Of these mines, 102 were surface mines, 33 were drift mines, and 6 were combinations. The principal net acid sources were found to be inactive strip mines which contributed in excess of 72 percent of the total load within the sub-basin. As shown in the table, underground mine sources also contributed minor loads. The major source areas were in the Little Sandy Creek watershed and its principal tributary, Beaver Creek.

About 68 miles of streams, over 21 percent of the total, were affected by mine drainage in this area. In general, the area north of the community of Brandonville was not affected by mine drainage. Stream samples of Big Sandy Creek at Rockville had pH values as low as 4.0 but the pH was above 6.0 much of the time. Biological studies showed that conditions upstream of Brandonville are good, but that the downstream reaches are subject to acid slugs.

The results of this study show the need to control drainage from 49 underground mine openings and 219 acres of strip-mined land. Also, about one acre of refuse will need to be disposed of or reclaimed. An additional 58 acres affected by surface mining needs to be planted to establish control of erosion and acid formation.

SUB-BASIN 19 TOTAL NO. OF SITES 141 TOTAL NET ACID 1,496 lbs/day TOTAL IRON 160 lbs/day

| | | Drift | Strip | Shaft and/or Slope | Strip & Drift | Strip & Auger | Prep. Plant | Refuse Pile | Total |
|---|---|---|---|---|---|---|---|---|---|
| ACTIVE SITES | | | | | | | | | |
| No. of Sites | Dry | - | 3 | - | - | 1 | - | - | 4 |
| | Draining | 1 | - | - | - | - | - | - | 1 |
| | Total | 1 | 3 | - | - | 1 | - | - | 5 |
| Load | Net Acid | 67 | - | - | - | - | - | - | 67 |
| | Total Iron | 14 | - | - | - | - | - | - | 14 |
| INACTIVE SITES | | | | | | | | | |
| No. of Sites | Dry | 16 | 78 | - | 1 | - | - | - | 95 |
| | Draining | 16 | 19 | - | 5 | 1 | - | - | 41 |
| | Total | 32 | 97 | - | 6 | 1 | - | - | 136 |
| Load | Net Acid | 229 | 1,075 | - | 85 | 40 | - | - | 1,429 |
| | Total Iron | 30 | 105 | - | 7 | 4 | - | - | 146 |
| TOTAL SITES | | | | | | | | | |
| No. of Sites | Dry | 16 | 81 | - | 1 | 1 | - | - | 99 |
| | Draining | 17 | 19 | - | 5 | 1 | - | - | 42 |
| | Total | 33 | 100 | - | 6 | 2 | - | - | 141 |
| Load | Net Acid | 296 | 1,075 | - | 85 | 40 | - | - | 1,496 |
| | Total Iron | 44 | 105 | - | 7 | 4 | - | - | 160 |

## SUB-BASIN NO. 20

### UPPER CHEAT RIVER

The Upper Cheat River sub-basin is composed of 330 square miles of drainage area and includes all drainage to the Cheat River from its formation at Parsons, West Virginia to Albright, West Virginia, 47 miles downstream.

Coals of the Monongahela, Conemaugh, Pottsville, and Allegheny Groups are present in the sub-basin. No mining has occurred in coals of the Pottsville Group. Most mining has been done in the Upper Freeport coal of the Allegheny Group. Coal mining has been an important industry in this area since the late 1800's. Surface mining has become important in recent years. At the time of the field inventory, 22 drift mines and 6 strip mines were active. It is anticipated that strip and auger mining will become increasingly important in the sub-basin.

A total of 213 sites were inventoried in the Upper Cheat River sub-basin. Of these, 120 were underground mines, 77 were strip mines, and 5 were combinations. Active underground mines were found to be the principal net acid sources, and discharged about 34 percent of the total load in the sub-basin. Inactive underground mines were also principal net acid sources and discharged about 25 percent of the sub-basin total.

The major source areas were four adjacent tributaries to the Cheat River between Tunnelton and Kingwood. Over 30 miles of streams in this area are affected by mine drainage. Data from stream samples from the Cheat River at Parsons showed a pH range of 4.9 to 7.4. Downstream, at Albright, water quality was further degraded as exhibited by a pH range of 3.4 to 6.2 at that location. Biological studies showed that the stream is of fair quality to just downstream from Rowlesburg, and that deteriorated water quality conditions exist at all stations farther downstream. These findings are consistent with the source inventory data.

The results of the study show the need for reclamation of 137 acres of surface mined land, construction of 91 mine opening seals, and reclamation of about 7 acres of refuse piles.

SUB-BASIN 20 TOTAL NO. OF SITES 213 TOTAL NET ACID lbs/day 19,958 TOTAL IRON lbs/day 5,166

| | | Drift | Strip | Shaft and/or Slope | Strip & Drift | Strip & Auger | Prep. Plant | Refuse Pile | Coal Storage Area | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| **ACTIVE SITES** | | | | | | | | | | |
| No. of Sites | Dry | 6 | 2 | - | - | - | 2 | - | | 10 |
| | Draining | 16 | 4 | - | - | - | 3 | - | | 23 |
| | Total | 22 | 6 | - | - | - | 5 | - | | 33 |
| Load | Net Acid | 6,823 | 180 | - | - | - | 2,724 | - | | 9,727 |
| | Total Iron | 1,026 | 35 | - | - | - | 714 | - | | 1,775 |
| **INACTIVE SITES** | | | | | | | | | | |
| No. of Sites | Dry | 56 | 38 | - | 1 | 2 | 4 | 1 | 1 | 103 |
| | Draining | 42 | 29 | - | 4 | 2 | - | - | - | 77 |
| | Total | 98 | 67 | - | 5 | 4 | 4 | 1 | 1 | 180 |
| Load | Net Acid | 5,047 | 428 | - | 2,315 | 2,441 | - | - | - | 10,231 |
| | Total Iron | 2,381 | 73 | - | 677 | 260 | - | - | - | 3,391 |
| **TOTAL SITES** | | | | | | | | | | |
| No. of Sites | Dry | 62 | 40 | - | 1 | 2 | 6 | 1 | 1 | 113 |
| | Draining | 58 | 33 | - | 4 | 2 | 3 | - | - | 100 |
| | Total | 120 | 73 | - | 5 | 4 | 9 | 1 | 1 | 213 |
| Load | Net Acid | 11,870 | 608 | - | 2,315 | 2,441 | 2,724 | - | - | 19,958 |
| | Total Iron | 3,407 | 108 | - | 677 | 260 | 714 | - | - | 5,166 |

## SUB-BASIN NO. 21

### SHAVERS FORK

The Shavers Fork sub-basin drains 215 square miles of the headwaters area of the Monongahela River basin, and contains an estimated 323 miles of streams.

Outcropping coals in this area are restricted to those of the Pottsville Group. Older rock units are also present in the sub-basin, but are not coal-bearing. Five coal seams have been mined from the Pottsville Group. Early mining was entirely by drift mining, but surface mining was later introduced into the area. At the time of the field inventory, one strip mine and two drift mines were active. The Shavers Fork area contains large untapped reserves of coal, particularly in the Sewell and Hughes Ferry seams.

A total of 37 underground mines, 12 surface mines, and one combination mine were inventoried. Inactive drift mines were found to be the principal net acid source and discharged about 65 percent of the total load in the sub-basin. Inactive surface mines also discharged a significant net acid load.

Stream water quality data at Cheat Bridge and Parsons indicate that water quality generally improves downstream. The stream varies from moderately acidic to moderately alkaline with low concentrations of pollutants. A benthic biology study showed no definite signs of pollution of any kind, but did indicate that this was not a productive stream.

The results of this study show the need of abatement involving the surface reclamation of 95 acres and the sealing of 28 underground mine openings. Two acres of refuse piles require reclamation. In addition, 4,500 feet of diversion ditches and 40 acres of reforestation are recommended for this area.

SUB-BASIN 21 TOTAL NO. OF SITES 50 TOTAL NET ACID lbs/day 763 TOTAL IRON lbs/day 73

| | | Drift | Strip | Shaft and/or Slope | Strip & Drift | Strip & Auger | Prep. Plant | Refuse Pile | Total |
|---|---|---|---|---|---|---|---|---|---|
| **ACTIVE SITES** | | | | | | | | | |
| No. of Sites | Dry | - | 1 | - | - | - | - | - | 1 |
| | Draining | 2 | - | - | - | - | - | - | 2 |
| | Total | 2 | 1 | - | - | - | - | - | 3 |
| Load | Net Acid | 8 | - | - | - | - | - | - | 8 |
| | Total Iron | 0 | - | - | - | - | - | - | 0 |
| **INACTIVE SITES** | | | | | | | | | |
| No. of Sites | Dry | 15 | 2 | - | - | - | - | - | 17 |
| | Draining | 20 | 6 | - | 1 | 3 | - | - | 30 |
| | Total | 35 | 8 | - | 1 | 3 | - | - | 47 |
| Load | Net Acid | 499 | 58 | - | 1 | 197 | - | - | 755 |
| | Total Iron | 40 | 6 | - | 0 | 27 | - | - | 73 |
| **TOTAL SITES** | | | | | | | | | |
| No. of Sites | Dry | 15 | 3 | - | - | - | - | - | 18 |
| | Draining | 22 | 6 | - | 1 | 3 | - | - | 32 |
| | Total | 37 | 9 | - | 1 | 3 | - | - | 50 |
| Load | Net Acid | 507 | 58 | - | 1 | 197 | - | - | 763 |
| | Total Iron | 40 | 6 | - | 0 | 27 | - | - | 73 |

## SUB-BASIN NO. 22

### BLACKWATER RIVER AREA

The Blackwater River sub-basin area includes the drainage area of the Black Fork, which is formed by the Blackwater River and the Dry Fork. Virtually all mines found were in the Blackwater River area which encompasses 140 square miles. The total area of the sub-basin is 499 square miles.

Seven coal seams in the Pottsville and Conemaugh groups and the Allegheny Formation have been mined in this area. Mining has been primarily in the Upper Freeport and Bakerstown coals of the Allegheny and Conemaugh groups. Mining history of the sub-basin shows that most of the underground mining was done by two companies and was largely finished by the 1930's. Strip mining has occurred along most of the workable seam outcrops. At the time of the field inventory, one drift mine and three strip mines were in operation. The major reserves of minable coal are in the Upper Freeport and Bakerstown seams. The reserves are primarily removable by strip mining.

The results of the inventory indicate 51 acres of mine refuse, 1,082 acres left disturbed by strip mining, 47 underground mine openings, and a 5-acre coke oven problem area. Twenty inactive drift mine openings and 30 inactive strip mines discharged 43 percent and

54 percent, respectively, of the total net acid load. The other source types contributed only a small amount to the acid problem. The major acid source areas were the lower portion of Beaver Creek and North Branch, tributaries to the Blackwater River in the vicinity of Davis, West Virginia.

Stream water quality data from the Blackwater River near the community of Hendricks showed consistent acid conditions with a pH range of 3.4 - 5.3. Biological studies showed that the Blackwater River upstream from Beaver Creek contains a balanced, abundant aquatic life population dominated by organisms intolerant to pollution. Beaver Creek contained no living organisms at its point of inspection and the Blackwater River downstream from Beaver Creek contained a limited, low-density aquatic life population.

The results of the study of this sub-basin area show the need to control drainage from 891 acres of disturbed surface mining area, 56 acres of mine refuse, and 24 underground mine openings. Additionally, an estimated 5,000 feet of stream channel improvement appears warranted to help restore water quality conditions.

SUB-BASIN 22 TOTAL NO. OF SITES - 129 TOTAL NET ACID lbs/day 11,816 TOTAL IRON lbs/day 1,282

| | | Drift | Strip | Shaft and/or Slope | Strip & Drift | Strip & Auger | Prep. Plant | Refuse Pile | Total |
|---|---|---|---|---|---|---|---|---|---|
| ACTIVE SITES | | | | | | | | | |
| No. of Sites | Dry | 1 | 1 | - | - | - | - | - | 2 |
| | Draining | - | 2 | - | - | - | - | - | 2 |
| | Total | 1 | 3 | - | - | - | - | - | 4 |
| Load | Net Acid | - | 280 | - | - | - | - | - | 280 |
| | Total Iron | - | 54 | - | - | - | - | - | 54 |
| INACTIVE SITES | | | | | | | | | |
| No. of Sites | Dry | 19 | 47 | 4 | - | 4 | - | - | 74 |
| | Draining | 20 | 30 | - | - | 1 | - | - | 51 |
| | Total | 39 | 77 | 4 | - | 5 | - | - | 125 |
| Load | Net Acid | 5,123 | 6,413 | - | - | 0 | - | - | 11,536 |
| | Total Iron | 525 | 703 | - | - | 0 | - | - | 1,228 |
| TOTAL SITES | | | | | | | | | |
| No. of Sites | Dry | 20 | 48 | 4 | - | 4 | - | - | 76 |
| | Draining | 20 | 32 | - | - | 1 | - | - | 53 |
| | Total | 40 | 80 | 4 | - | 5 | - | - | 129 |
| Load | Net Acid | 5,123 | 6,693 | - | - | 0 | - | - | 11,816 |
| | Total Iron | 525 | 757 | - | - | 0 | - | - | 1,282 |

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## SUB-BASIN NO. 23

### LOWER YOUGHIOGHENY RIVER

The Lower Youghiogheny River sub-basin comprises 259 square miles and includes all drainage to the Youghiogheny River from the Westmoreland-Fayette county line (Pennsylvania) downstream to McKeesport, Pennsylvania, a distance of 25 miles.

Six coal seams have been mined in the Monongahela and Conemaugh groups and the Allegheny Formation. Coals of the Monongahela Group have been most important in the sub-basin. History of mining in the area shows operations have been active since the early 1800's. Underground methods are the principal means of past and present extraction. Surface mining was not extensive and auger mining was rare in this area. Four slope mines, one drift mine, three strip mines, and two strip and drift combination mines were in operation at the time of the field inventory. The principal minable reserves are believed to be in the Redstone and Upper Freeport coals.

A total of 273 sites were inventoried in the Lower Youghiogheny River sub-basin. Of these, 135 were underground mines, 96 were surface mines, and 41 were combined underground-surface operations. Inactive and active underground mines contributed almost equally to the net acid load and accounted for 74 percent of the sub-basin net acid load. Inactive surface mines were large acid contributors also. The areas south of the community of West Newton, in the vicinity of the communities of Irwin and Sutersville, and the headwaters of Turtle Creek were major acid source areas.

A total of 106 miles of streams in this sub-basin were affected by mine drainage. At Sutersville, Pennsylvania, the pH ranged from 3.8 to 6.8 and a maximum net acidity of 94 mg/l was recorded.

The results of the study show the need to control drainage from 140 underground mine openings. Additionally, surface reclamation of 304 acres of strip-mined land, 48 acres of refuse piles, and 20 acres of subsidence will be needed for drainage control. Preliminary estimates of drainage control measures indicate that substantial remedial work should be applied to the interconnection of several underground mines.

SUB-BASIN 23 TOTAL NO. OF SITES 273 TOTAL NET ACID 76,019 lbs/day TOTAL IRON 21,175 lbs/day

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| | | Drift | Strip | Shaft and/or Slope | Strip & Drift | Strip & Auger | Prep. Plant | Refuse Pile | Total |
|---|---|---|---|---|---|---|---|---|---|
| **ACTIVE SITES** | | | | | | | | | |
| No. of Sites | Dry | - | 1 | 3 | - | - | - | - | 4 |
| | Draining | 1 | 2 | 1 | 2 | - | - | - | 6 |
| | Total | 1 | 3 | 4 | 2 | - | - | - | 10 |
| Load | Net Acid | 7 | 579 | 26,246 | 438 | - | - | - | 27,270 |
| | Total Iron | 0 | 9 | 7,613 | 13 | - | - | - | 7,635 |
| **INACTIVE SITES** | | | | | | | | | |
| No. of Sites | Dry | 67 | 62 | 18 | 15 | - | 1 | - | 163 |
| | Draining | 43 | 30 | 2 | 24 | 1 | - | - | 100 |
| | Total | 110 | 92 | 20 | 39 | 1 | 1 | - | 263 |
| Load | Net Acid | 29,836 | 10,162 | 41 | 5,928 | 2,782 | - | - | 48,749 |
| | Total Iron | 11,691 | 722 | 0 | 975 | 152 | - | - | 13,540 |
| **TOTAL SITES** | | | | | | | | | |
| No. of Sites | Dry | 67 | 63 | 21 | 15 | - | 1 | - | 167 |
| | Draining | 44 | 32 | 3 | 26 | 1 | - | - | 106 |
| | Total | 111 | 95 | 24 | 41 | 1 | 1 | - | 273 |
| Load | Net Acid | 29,843 | 10,741 | 26,287 | 6,366 | 2,782 | - | - | 76,019 |
| | Total Iron | 11,691 | 731 | ,613 | 988 | 152 | - | - | 21,175 |

## SUB-BASIN NO. 24

### SEWICKLEY CREEK

The Sewickley Creek sub-basin drains an area of 168 square miles east of the Youghiogheny River in Westmoreland County, Pennsylvania.

Coals of the Monongahela, Allegheny, and Conemaugh groups are present in this study area. Six coal seams have been mined. History of mining in the area shows an early increase of high-grade coal extraction and then a marked decline to the present minor level of coal production in the sub-basin. At the time of the field inventory, there were nine active underground mines and six small active strip mines. The major reserves of minable coal are in the Upper Freeport coal of the Allegheny Formation.

During the field inventory a total of 187 acres of mine refuse, 1357 acres of subsidence area, 497 acres of surface mining disturbance, 226 underground mine openings, and five special problem areas were documented. One active shaft mine was the principal net acid source and discharged about 46 percent of the total net acid load in the sub-basin. Inactive drift mines were the next most significant acid contributors. Acid source areas generally cover the entire sub-basin but are concentrated in the southern and western portions of the drainage area.

A total of 41 miles of streams in the study area were considered to be affected by mine drainage. A stream sample station on Sewickley Creek at Lowber, Pennsylvania, showed that the pH level of the stream was below 5.0 most of the time with a range of 3.3 to 6.0. Acidity concentrations in excess of 250 mg/l at this location were common during the survey period. Results of biological studies of the stream showed that, with the exception of the headwaters area, aquatic organisms present were those recognized as acid-tolerant.

The results of the study show the need to control the drainage from 195 underground mine openings. Surface reclamation is needed for 497 acres of surface-mined area, 1,357 acres of subsidence area, 187 acres of refuse piles. Five special mine drainage problem areas require special studies to determine the feasibility of abatement.

SUB-BASIN 24 TOTAL NO. OF SITES 266 TOTAL NET ACID lbs/day 90,144 TOTAL IRON lbs/day 37,496

| | | Drift | Strip | Shaft and/or Slope | Strip & Drift | Strip & Auger | Prep. Plant | Refuse Pile | Total |
|---|---|---|---|---|---|---|---|---|---|
| **ACTIVE SITES** | | | | | | | | | |
| No. of Sites | Dry | 4 | 6 | - | - | - | 2 | - | 12 |
| | Draining | 4 | - | 1 | - | - | - | - | 5 |
| | Total | 8 | 6 | 1 | - | - | 2 | - | 17 |
| Load | Net Acid | 1,628 | - | 41,159 | - | - | - | - | 42,787 |
| | Total Iron | 321 | - | 15,739 | - | - | - | - | 16,060 |
| **INACTIVE SITES** | | | | | | | | | |
| No. of Sites | Dry | 63 | 82 | 19 | 31 | - | 1 | - | 196 |
| | Draining | 32 | 4 | 9 | 6 | 1 | - | 1 | 53 |
| | Total | 95 | 86 | 28 | 37 | 1 | 1 | 1 | 249 |
| Load | Net Acid | 29,836 | 168 | 15,110 | 471 | 66 | - | 1,706 | 47,357 |
| | Total Iron | 11,016 | 15 | 9,053 | 580 | 16 | - | 756 | 21,436 |
| **TOTAL SITES** | | | | | | | | | |
| No. of Sites | Dry | 67 | 88 | 19 | 31 | - | 3 | - | 208 |
| | Draining | 36 | 4 | 10 | 6 | 1 | - | 1 | 58 |
| | Total | 103 | 92 | 29 | 37 | 1 | 3 | 1 | 266 |
| Load | Net Acid | 31,464 | 168 | 56,269 | 471 | 66 | - | 1706 | 90,144 |
| | Total Iron | 11,337 | 15 | 24,792 | 580 | 16 | - | 756 | 37,496 |

## SUB-BASIN NO. 25

### MIDDLE YOUGHIOGHENY RIVER

The Middle Youghiogheny River sub-basin drains 149 square miles and includes all drainage to the 14-mile reach of the Youghiogheny River from the Westmoreland-Fayette county line upstream to Connellsville, Pennsylvania.

Seven coal seams have been mined in the area. The mining of coals of the Monongahela and Allegheny groups has been dominant. Mining history in the area records mining since the early 1800's. Underground methods were the principal means of extraction but strip mining has also been widely utilized. At the time of the field study, four strip mines were active in the watershed. The major reserves of minable coal are in the Upper Freeport coal of the Allegheny Group.

A total of 152 sites were inventoried in the Middle Youghiogheny River sub-basin. Of these, 40 were drift mines, 81 were strip mines, five were shaft mines, and 25 were combination underground-surface mines. Inactive drift mines, some combined with strip mines, were found to be the principal net acid source and discharged 98 percent of the total load in the sub-basin. The major net acid source areas were the minor tributaries on the east bank of the Youghiogheny River, exclusive of Jacobs Creek.

A total of 68 miles of streams was affected by mine drainage in the sub-basin. The pH level of water samples taken from Jacobs

Creek near its mouth ranged from 4.6 to 7.1.

The results of this study show the need to control drainage from 466 acres of surface-mined area, 223 acres of refuse piles, 70 acres of subsidence, and 17 underground mine openings.

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SUB-BASIN 25 TOTAL NO. OF SITES 152 TOTAL NET ACID lbs/day 3,185 TOTAL IRON lbs/day 622

| | | Drift | Strip | Shaft and/or Slope | Strip & Drift | Strip & Auger | Prep. Plant | Refuse Pile | Total |
|---|---|---|---|---|---|---|---|---|---|
| **ACTIVE SITES** | | | | | | | | | |
| No. of Sites | Dry | - | 3 | - | - | - | - | - | 3 |
| | Draining | - | 1 | - | - | - | - | - | 1 |
| | Total | - | 4 | - | - | - | - | - | 4 |
| Load | Net Acid | - | 34 | - | - | - | - | - | 34 |
| | Total Iron | - | 4 | - | - | - | - | - | 4 |
| **INACTIVE SITES** | | | | | | | | | |
| No. of Sites | Dry | 28 | 68 | 5 | 18 | - | 1 | - | 120 |
| | Draining | 12 | 9 | - | 7 | - | - | - | 28 |
| | Total | 40 | 77 | 5 | 25 | - | 1 | - | 148 |
| Load | Net Acid | 1,847 | 37 | - | 1,267 | - | - | - | 3,151 |
| | Total Iron | 365 | 1 | - | 252 | - | - | - | 618 |
| **TOTAL SITES** | | | | | | | | | |
| No. of Sites | Dry | 28 | 71 | 5 | 18 | - | 1 | - | 123 |
| | Draining | 12 | 10 | - | 7 | - | - | - | 29 |
| | Total | 40 | 81 | 5 | 25 | - | 1 | - | 152 |
| Load | Net Acid | 1,847 | 71 | - | 1,267 | - | - | - | 3,185 |
| | Total Iron | 365 | 5 | - | 252 | - | - | - | 622 |

## SUB-BASIN NO. 26

### MOUNTS CREEK AND INDIAN CREEK

The Mounts Creek and Indian Creek watersheds are adjacent drainage areas tributary to the Youghiogheny River from the northeast in the vicinity of Connellsville, Pennsylvania. Indian Creek is the larger stream and drains an area of 125 square miles. The Mounts Creek drainage area is 32 square miles.

Eight coal seams in the Conemaugh Croup and the Allegheny Formation have been mined in the sub-basin. Coals of the Allegheny Formation have been most important. History of mining in the area records mining operations since the early 1800's. Underground mining has been the dominant type of mining; however, surface mining has become prominent since the 1940's. At the time of the field inventory, there were 12 active underground mines and four active strip mines. The major reserves of minable coal are in the Brookville and Lower Kittanning coals.

A total of 146 sites were inventoried in the Mounts Creek and Indian Creek sub-basin. Of these, 105 were drift mines and 33 were strip mines. Fifty-eight of the mines were discharging at time of inspection. Inactive drift mines were the principal source of net acid and discharged about 96 percent of the total load in the sub-basin. The major source areas were Champion Creek and Poplar Run, tributary to Indian Creek, and the lower portion of Indian Creek. Mine discharges were limited to the Indian Creek watershed at the time of the study. A total of 28 miles of streams are affected by mine drainage in this sub-basin. Water samples taken from Indian Creek near its mouth had a pH range of 2.9 to 5.9 which indicated a consistently acid condition.

The results from the study show the need to control drainage from 25 underground mine openings, five acres of refuse piles, and 228 acres of strip-mined land. The discharge from a large underground mine drainage collection system may require treatment as the best abatement procedure.

SUB-BASIN 26 TOTAL NO. OF SITES 146 TOTAL NET ACID lbs/day 10,076 TOTAL IRON lbs/day 1,639

| | | Drift | Strip | Shaft and/or Slope | Strip & Drift | Strip & Auger | Prep. Plant | Refuse Pile | Total |
|---|---|---|---|---|---|---|---|---|---|
| ACTIVE SITES | | | | | | | | | |
| No. of Sites | Dry | 6 | 3 | - | - | - | - | - | 9 |
| | Draining | 6 | 1 | - | - | - | - | - | 7 |
| | Total | 12 | 4 | - | - | - | - | - | 16 |
| Load | Net Acid | 155 | 1 | - | - | - | - | - | 156 |
| | Total Iron | 44 | 0 | - | - | - | - | - | 44 |
| INACTIVE SITES | | | | | | | | | |
| No. of Sites | Dry | 53 | 20 | 3 | 2 | - | 1 | - | 79 |
| | Draining | 40 | 9 | 2 | - | - | - | - | 51 |
| | Total | 93 | 29 | 5 | 2 | - | 1 | - | 130 |
| Load | Net Acid | 9,712 | 151 | 57 | - | - | - | - | 9,920 |
| | Total Iron | 1,555 | 33 | 7 | - | - | - | - | 1,595 |
| TOTAL SITES | | | | | | | | | |
| No. of Sites | Dry | 59 | 23 | 3 | 2 | - | 1 | - | 88 |
| | Draining | 46 | 10 | 2 | - | - | - | - | 58 |
| | Total | 105 | 33 | 5 | 2 | - | 1 | - | 146 |
| Load | Net Acid | 9,867 | 152 | 57 | - | - | - | - | 10,076 |
| | Total Iron | 1,599 | 33 | 7 | - | - | - | - | 1,639 |

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## SUB-BASIN NO. 27

### YOUGHIOGHENY RIVER WEST

The Youghiogheny River West sub-basin comprises 183 square miles and includes all drainage to the Youghiogheny River from Connellsville, Pennsylvania, to Confluence, Pennsylvania, 30 miles upstream.

Ten coals in the Monongahela, Conemaugh, and Allegheny groups have been mined in the sub-basin. Mining has existed in this study area since the early 1800's. Although early mining was by underground methods, underground and surface mining methods are employed about equally at the present time. At the time of the field inventory, three strip mines were active. The major reserves of minable coal are in the Upper Freeport seam of the Allegheny Formation.

A total of 69 sites were inventoried in the Youghiogheny River West sub-basin. Of these, 23 were drift mines, 38 were strip mines, two were combined underground-surface mines, and five were slope and shaft mines. Inactive strip mines were the principal net acid source and discharged about 57 percent of the total net acid load in the sub-basin. As the table of drainage sources shows, each of the other source types contributed to the problem. The major source areas were tributary watersheds on the west bank of the Youghiogheny River and included Jonathon Run, Laurel Run, and Dunbar Creek.

A total of 30 miles of streams were affected by mine drainage in this sub-basin area. This is about 10 percent of the total stream mileage.

The mine drainage inventory revealed the need to control drainage from eight underground mine openings, five acres of refuse piles, and 266 acres of strip-mined land.

SUB-BASIN 27 TOTAL NO. OF SITES 69 TOTAL NET ACID lbs/day 783 TOTAL IRON lbs/day 162

| | | Drift | Strip | Shaft and/or Slope | Strip & Drift | Strip & Auger | Prep. Plant | Refuse Pile | Shaft & Strip | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| **ACTIVE SITES** | | | | | | | | | | |
| No. of Sites | Dry | - | - | - | - | - | - | - | - | - |
| | Draining | - | 3 | - | - | - | - | - | - | 3 |
| | Total | - | 3 | - | - | - | - | - | - | 3 |
| Load | Net Acid | - | 111 | - | - | - | - | - | - | 111 |
| | Total Iron | - | 11 | - | - | - | - | - | - | 11 |
| **INACTIVE SITES** | | | | | | | | | | |
| No. of Sites | Dry | 15 | 32 | 4 | 1 | - | - | - | - | 52 |
| | Draining | 8 | 3 | 1 | 1 | - | - | - | 1 | 14 |
| | Total | 23 | 35 | 5 | 2 | - | - | - | 1 | 66 |
| Load | Net Acid | 204 | 444 | 23 | 1 | - | - | - | 0 | 672 |
| | Total Iron | 47 | 103 | 1 | 0 | - | - | - | 0 | 151 |
| **TOTAL SITES** | | | | | | | | | | |
| No. of Sites | Dry | 15 | 32 | 4 | 1 | - | - | - | - | 52 |
| | Draining | 8 | 6 | 1 | 1 | - | - | - | 1 | 17 |
| | Total | 23 | 38 | 5 | 2 | - | - | - | 1 | 69 |
| Load | Net Acid | 204 | 555 | 23 | 1 | - | - | - | 0 | 783 |
| | Total Iron | 47 | 114 | 1 | 0 | - | - | - | 0 | 162 |

## SUB-BASIN NO. 28

### LAUREL HILL CREEK

The Laurel Hill Creek sub-basin drains an area of 125 square miles north of Connellsville, Pennsylvania, in the Youghiogheny River basin.

Coals of the Conemaugh and Allegheny group crop out in the sub-basin. Four coal seams in the two rock units have been mined. Mining in this area dates back to the 1800's when a seam is reported to have been mined for local use. Mining has been almost entirely by drift operations. No mines were active at the time of the study. The major reserves of minable coal are in the Upper and Lower Freeport and Upper and Lower Kittanning seams of the Allegheny Formation.

A total of 30 sites were inventoried, which included 28 drift mines and only two strip mines. Inactive drift mines were the only source of net acid discharge and discharged only 34 pounds per day. The major source areas were along Smith Run and Red Run.

Four miles of streams were affected by mine drainage in this sub-basin. A stream sample station on Laurel Hill Creek near its mouth had pH levels ranging from 5.3 to 6.5. The available data indicate that the stream was only slightly affected by mine drainage.

The results of the study indicate a need to control drainage from five acres of refuse piles, five acres of subsidence area, and 11 underground mine openings.

SUB-BASIN 28 TOTAL NO. OF SITES 30 TOTAL NET ACID lbs/day 34 TOTAL IRON lbs/day 3

| | | Drift | Strip | Shaft and/or Slope | Strip & Drift | Strip & Auger | Prep. Plant | Refuse Pile | Total |
|---|---|---|---|---|---|---|---|---|---|
| **ACTIVE SITES** | | | | | | | | | |
| No. of Sites | Dry | NO ACTIVE SITES | | | | | | | |
| | Draining | | | | | | | | |
| | Total | | | | | | | | |
| Load | Net Acid | | | | | | | | None |
| | Total Iron | | | | | | | | |
| **INACTIVE SITES** | | | | | | | | | |
| No. of Sites | Dry | 16 | 2 | - | - | - | - | - | 18 |
| | Draining | 12 | - | - | - | - | - | - | 12 |
| | Total | 28 | 2 | - | - | - | - | - | 30 |
| Load | Net Acid | 34 | - | - | - | - | - | - | 34 |
| | Total Iron | 3 | - | - | - | - | - | - | 3 |
| **TOTAL SITES** | | | | | | | | | |
| No. of Sites | Dry | 16 | 2 | - | - | - | - | - | 18 |
| | Draining | 12 | - | - | - | - | - | - | 12 |
| | Total | 28 | 2 | - | - | - | - | - | 28 |
| Load | Net Acid | 34 | - | - | - | - | - | - | 34 |
| | Total Iron | 3 | - | - | - | - | - | - | 3 |

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## SUB-BASIN NO. 29

### CASSELMAN RIVER

The Casselman River sub-basin drains an area of 465 square miles containing portions of Maryland and Pennsylvania. The Casselman River enters the Youghiogheny River at Confluence, Pennsylvania.

Ten coal seams in the Monongahela and Conemaugh groups and the Allegheny Formation are present in the area. Although strata of the Pottsville Group crop out in the sub-basin, no minable coals in this rock unit are present. This area became an established mining region during World War I. Underground mining was the only form of extraction until World War II when strip mining became dominant. At the time of the inventory, there were 22 active strip mines, 17 active drift mines, and one active combination strip and drift mine. Five minable coal seams of the Allegheny Group (Upper Freeport, Lower Freeport, Upper Kittanning, Lower Kittanning, and Brookville) all contain large reserves for future development.

The inventory revealed 1,903 acres left disturbed by surface mining and 346 underground mine openings in the Casselman River sub-basin. Inactive drift mines were the principal net acid source and discharged about 77 percent of the total load in the sub-basin. The accompanying table shows the contribution from the other source types. The principal source areas were Coal Run-Shaw Mining complex and the Buffalo Creek area.

A total of 125 miles of streams were affected by mine drainage in this area. Available water quality data show that relatively good water quality existed in the upper third of the main stream downstream to Salisbury, Pennsylvania. Downstream from this point, the stream was usually acidic and of poor quality. The pH level of samples from the Casselman River at Markleton, Pennsylvania, ranged from 3.1 to 6.2.

The results of this study show a need to control drainage from 223 underground mine openings and 488 acres of strip-mined land.

SUB-BASIN 29 TOTAL NO. OF SITES 417 TOTAL NET ACID lbs/day 55,576 TOTAL IRON lbs/day 8,512

| | | Drift | Strip | Shaft and/or Slope | Strip & Drift | Strip & Auger | Prep. Plant | Refuse Pile | Total |
|---|---|---|---|---|---|---|---|---|---|
| **ACTIVE SITES** | | | | | | | | | |
| No. | Dry | 9 | 15 | - | - | - | 2 | - | 26 |
| of | Draining | 8 | 7 | - | 1 | - | 2 | - | 18 |
| Sites | Total | 17 | 22 | - | 1 | - | 4 | - | 44 |
| Load | Net Acid | 1,239 | 1,408 | - | 2,918 | - | 25 | - | 5,590 |
| | Total Iron | 192 | 301 | - | 230 | - | 4 | - | 727 |
| **INACTIVE SITES** | | | | | | | | | |
| No. | Dry | 112 | 87 | 3 | 2 | - | 2 | 2 | 208 |
| of | Draining | 108 | 51 | 1 | 5 | - | - | - | 165 |
| Sites | Total | 220 | 138 | 4 | 7 | - | 2 | 2 | 373 |
| Load | Net Acid | 42,964 | 2,630 | 1,248 | 3,144 | - | - | - | 49,986 |
| | Total Iron | 6,769 | 397 | 441 | 178 | - | - | - | 7,785 |
| **TOTAL SITES** | | | | | | | | | |
| No. | Dry | 121 | 102 | 3 | 2 | - | 4 | 2 | 234 |
| of | Draining | 116 | 58 | 1 | 6 | - | 2 | - | 183 |
| Sites | Total | 237 | 160 | 4 | 8 | - | 6 | 2 | 417 |
| Load | Net Acid | 44,203 | 4,038 | 1,248 | 6,062 | - | 25 | - | 55,576 |
| | Total Iron | 6,961 | 698 | 441 | 408 | - | 4 | - | 8,512 |

## SUB-BASIN NO. 30

### UPPER YOUGHIOGHENY RIVER

The Upper Youghiogheny River sub-basin comprises 434 square miles and includes all drainage to the Youghiogheny River from its headwaters to Confluence, Pennsylvania.

Coals of the Conemaugh, Pottsville, and Allegheny groups are present in the sub-basin. Thirteen coal seams in these three rock units have been mined. No major commercial mining has occurred in the area. A series of small drift mines accounts for most of the mining that has taken place. Strip mining has been minimal. At the time of the field inventory, four drift mines and two strip mines were active. Minable coal reserves are not extensive or of high quality but could support small mining operations.

A total of 84 sites were inventoried in the Upper Youghiogheny River sub-basin. Forty-one of these were underground mines, 37 were strip mines, and six were combination strip and drift mines. Inactive drift mines were the principal net acid source and discharged about 63 percent of the total load in the sub-basin. Inactive strip mines were also a significant net acid source. The major source area was a small mining area on Laurel Run and Snowy Creek.

A total of 60 miles of streams were affected by mine drainage in the sub-basin. Water samples of the Youghiogheny River at Friendsville, Maryland, showed a pH range at that location of 4.9 to 6.4.

SUB-BASIN 30 TOTAL NO. OF SITES 84 TOTAL NET ACID lbs/day 1692 TOTAL IRON lbs/day 228

| | | Drift | Strip | Shaft and/or Slope | Strip & Drift | Strip & Auger | Prep. Plant | Refuse Pile | Total |
|---|---|---|---|---|---|---|---|---|---|
| ACTIVE SITES | | | | | | | | | |
| No. | Dry | 1 | 2 | - | - | - | - | - | 3 |
| of | Draining | 3 | - | - | - | - | - | - | 3 |
| Sites | Total | 4 | 2 | - | - | - | - | - | 6 |
| Load | Net Acid | 24 | - | - | - | - | - | - | 24 |
| | Total Iron | 2 | - | - | - | - | - | - | 2 |
| INACTIVE SITES | | | | | | | | | |
| No. | Dry | 21 | 21 | - | 2 | - | - | - | 44 |
| of | Draining | 16 | 14 | - | 4 | - | - | - | 34 |
| Sites | Total | 37 | 35 | - | 6 | - | - | - | 78 |
| Load | Net Acid | 1,073 | 508 | - | 87 | - | - | - | 1,668 |
| | Total Iron | 180 | 44 | - | 2 | - | - | - | 226 |
| TOTAL SITES | | | | | | | | | |
| No. | Dry | 22 | 23 | - | 2 | - | - | - | 47 |
| of | Draining | 19 | 14 | - | 4 | - | - | - | 37 |
| Sites | Total | 41 | 37 | - | 6 | - | - | - | 84 |
| | Net Acid | 1,097 | 508 | - | 87 | - | - | - | 1,692 |
| Load | Total Iron | 182 | 44 | - | 2 | - | - | - | 228 |

Similar data obtained from the Youghiogheny River at Confluence, Pennsylvania, showed a pH range of 4.3 to 6.6.

The results of the study show a need to control mine drainage from nine underground mine openings, one acre of refuse, and 123 acres disturbed by strip mining.

# ATTACHMENT B

# TO

# MONONGAHELA RIVER
# MINE DRAINAGE
# SUMMARY REPORT

## RECOMMENDATIONS OF EACH TECHNICAL COMMITTEE MEMBER

Recommendations to the Technical Committee on the matter of interstate pollution in the Monongahela River Basin caused by mine and mine-associated activities by the representative of the Federal Water Pollution Control Administration are:

1. A technical committee be established to supervise those abatement programs agreed to by the conferees. The committee be chaired by the Federal representative and be charged with but not limited to the following responsibilities:
    a. the establishment of Projects to carry out agreed to programs;
    b. preparation of periodic (semi-annual) progress reports for submission to the conferees and the Congress;
    c. establish methods by which to assign priorities to areas or sub-basins to receive abatement measures and to establish those priorities;
    d. provision of technical assistance to the State agencies on mine drainage pollution and its prevention and abatement;
    e. determine financial assistance required by State to carry out approved abatement programs and develop and justify budgetary requests to the Congress.
2. Prior to receiving any financial or technical assistance from the Federal Government, the State governments be required to adopt and enforce a program to abate present and future pollution from active mining operations; establish and define who will be responsible for

preventing pollution from mines that are presently active and will be abandoned in the future as well as the establishment of this responsibility for all future mines prior to their development; assume the responsibility for presently inactive mines and initiate an abatement program for the same; and develop a program for maintenance and operation of abatement facilities and measures.

3. An analysis of legal problems in abatement and control of water pollution from mines and mine-associated sites be made and that it include the following:

   I. Review of environmental quality problems resulting from all types of mines.

   II. Study of patterns of ownership of mineral rights in the region.

   III. Study of possible legal responses.

      A. Obtaining right of entry for reclamation work.

         1. Public acquisition of mineral rights.

            a. Without payment of compensation (re-recordation on abandonment type statutes).

            b. With payment of compensation.

         2. Public acquisition of whole fee.

      B. Assuring public "benefit" from reclamation work.

         1. Levy of "betterment" changes against owners of fee.

         2. Acquisition and sale of whole fee back to private sector.

            a. Urban renewal analogue.

            b. "Public purpose" problems.

   IV. Model legislation.

OHIO RIVER VALLEY
WATER SANITATION COMMISSION
414 WALNUT STREET, CINCINNATI, OHIO 45202

R. H. DYER, M.D.
CHAIRMAN
ROBERT K. HORTON
EXECUTIVE DIRECTOR
CHIEF ENGINEER

December 26, 1969

DEC 29 1969

Mr. A. D. Sidio
Federal Water Pollution Control Administration
5555 Ridge Avenue
Cincinnati, Ohio 45213

Dear Andy:

After further reflection on the deliberations of the Monongahela River Technical Committee at its meeting in Wheeling on December 2 to 4 and the recommendations that were adopted, I wish to submit the following comments as a minority report (all of which were touched on at the meeting), and ask that they be incorporated in the report that is to be submitted to the Conferees:

1. The report as it now stands is deficient in not recommending priorities for undertaking specific abatement projects should funds for this purpose be made available. Neither does the report offer guidelines or criteria to be considered in establishing priorities. These are matters that are inherent in the charge to the Technical Committee, which, among other things, included instructions to develop a remedial program.

2. One basis for establishment of priorities would be inclusion in the report of an economic analysis along the lines indicated in our letter of June 20, 1968, copy of which is attached. Such appraisals would be directed toward showing where the greatest return can be realized for a dollar spent.

3. When the time comes to implement remedial measures consideration should be given to utilization of the Ohio River Valley Water Sanitation Commission as the coordinating agency. The function of coordination should be conducted through formal arrangements rather than through another ad hoc committee. I am quite sure the states signatory to the ORSANCO compact will want to give consideration to this matter.

December 26, 1969

Mr. A. D. Sidio, FWPCA

For one thing, ORSANCO is a legally constituted regional agency, charged with responsibility for dealing with interstate pollution problems. Its membership includes representatives from the U. S. Department of the Interior and two of the three states involved, Pennsylvania and West Virginia. Participation of Maryland, which is not a signatory to the compact, does not pose any problems that would not otherwise present themselves in an ad hoc arrangement.

Not the least of the virtues in using ORSANCO lies in the fact that its data acquisition and evaluation system could be easily and quickly extended to provide monitoring services that will be needed. As was emphasized at the meeting, before-and-after monitoring on initial remedial projects will be of critical importance, since results from these projects will in large measure dictate future courses of action.

4. The Technical Committee can hardly afford not to include in its report consideration of the findings set forth in the Appalachian Regional Commission study on mine drainage control, which have been presented to Congress. Specifically, how may these findings be dovetailed into the Monongahela program?

5. If a recommendation is made that 5 million dollars be allocated for remedial work, the recommendation should be supported with substantive details and carry with it an explanation of precisely what is to be accomplished by such an expenditure. I know that this is a matter of concern to you, and I am appreciative of the attempt you made at the meeting to pin down some specifics. Until this is done, I do not see how I, or any other committee member for that matter, could responsibly endorse such a recommendation.

Sincerely yours,

Bob Horton

ROBERT K. HORTON

RKH/rb

cc: Messrs. Edgar N. Henry
Michael L. Rodevick, P.E.
Walter N. Heine
Walter A. Lyon
Henry P. Stetina

June 20, 1968

Mr. John R. Hyland, Project Director
Monongahela River Mine Drainage
Remedial Project
401 Methodist Building
Wheeling, West Virginia 26003

Dear John:

In reply to Andy Sidio's letter of May 27 transmitting review copies of sub-basin reports prepared by the Monongahela River Mine Drainage Remedial Project, you and your staff are to be complimented for an outstanding piece of work. The reports contain a wealth of basic information that is essential to resolution of the Technical Committee's assignment.

We believe the next step toward resolution of the committee's assignment should be the preparation by your staff of a General Summary. Such a summary, as we see it, should be directed toward an analysis of relative costs of abatement in the various sub-basins, arranged in some order of priority on the basis of unit costs.

To illustrate, a review of the data for some of the sub-basins produces the following unit costs:

| | Upper Youghiogheny | Dunkard Creek | Middle Fork | Upper Tygart | Buckhannon |
|---|---|---|---|---|---|
| Cost for remedial measures | $67,500 | $275,000 | $302,500 | $395,000 | $1,300,000 |
| Pounds of acid discharged | 1,561 | 7,950* | 5,579 | 19,656 | 4,059 |
| Pounds of iron discharged | 263 | 1,675** | 157 | 917 | 1,123 |
| Miles of stream to be improved | 50 | 28 | 24 | 12.5 | |

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O
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Y

| | | | | | |
|---|---|---|---|---|---|
| Cost for removal of 1 lb/day of acid | $40 | $35 | $54 | $20 | $320 |

*52,070 x 15% (from inactive mines)
**11,154 x 15% (from inactive mines)

| | | | | | |
|---|---|---|---|---|---|
| Cost for removal of 1 lb/day of iron | $256 | $164 | $1,940 | $480 | $1,160 |
| Cost for improvement of 1 mile of stream | $1,350 | $9,900 | $12,800 | $21,600 | |

There is another kind of evaluation that should also be made. For each sub-basin, a determination should be made of the number of sources of drainage requiring remedial measures for incremental reductions in acid loads (say 50%, 80%, and 90%), together with an estimate of the costs involved with each increment. This kind of evaluation will show where the greatest return can be obtained for a dollar spent.

Apart from the need for these additional economic appraisals, our principal reaction to the sub-basin reports is that more needs to be said regarding changes in stream quality characteristics that may be expected as a result of corrective programs. For example, analyses on conductance, hardness and sulfate levels indicate that some of the streams have very little buffering capacity. On these streams, therefore, there might be some question as to whether proposed remedial measures will bring about a significant improvement in pH levels.

Finally, we believe some attention should be given to unifying the presentations in each of the sub-basin reports so as to afford a more ready comparison of conditions among the various basins. For example, only the reports on Dunkard Creek and Blackwater River contain information on pH and conductance characteristics of individual mine discharges. The reports on Sewickley Creek, Blackwater River and Middle Fork do not summarize load measurements made at the mines. The report on Upper Tygart River does not contain information on stream loads. It would be helpful if the various kinds of information contained in some of the reports (stream loads, mine discharge loads, pH, conductance and flow characteristics of individual discharges) were included in all.

Sincerely,

ROBERT K. HORTON

cc: Mr. Sidio
Mr. Henry
Mr. Lyon
Mr. Weiss
Mr. Rodevick

C
O
P
Y

COMMISSION
AURICE SIEGEL
CHAIRMAN
I. HENRY SCHILPP
R. LAMAR GREEN
ROBERT J. McLEOD
DON A. EMERSON

DIRECTOR
P. W. McKEE

STATE OF MARYLAND
**DEPARTMENT OF WATER RESOURCES**
506 NORTH CENTRE STREET
P.O. BOX 697
CUMBERLAND, MARYLAND 21502

April 30, 1969

Dr. Don L. Warner, Ph. D.
Chief, Earth Sciences
Technical Programs Branch
Office of Operations
Ohio Basin Project
United States Department of
    the Interior
F. W. P. C. A.
Room 7027
Federal Office Building
550 Main Street
Cincinnati, Ohio 45202

Dear Dr. Warner:

At the February meeting of the Technical Committee, the members agreed to submit their recommendations for inclusion in the Final Report to the Enforcement Conference. The following are the recommendations of the Maryland member:

1. A committee be setup to review all statutory requirements in each state pertaining to mine drainage control. This committee would then develop proposed legislation in order that the three states involved would have the same basic statutory requirements. Recommendations should also be included for staff and training requirements. The aforementioned statutory requirements must be adequate to prevent pollution from future mining operation in their active, inactive or abandoned stages.

2. The states must immediately initiate a program to eliminate pollution from active mining operations. The state programs might need to be modified upon completion of Item #1.

3. The states must initiate a program for the correction of pollution from abandoned mines. Technical and financial assistance must be provided by the Federal Government in order to accomplish this task.

    A. The Technical Committee should develop a watershed priority list for the entire basin for the abatement of pollution from abandoned mines.

    B. It is advisable to consider immediate correction of individual discharges from abandoned mines. This should be done in areas that have very favorable cost/benefit ratios and that are technically feasible.

C. In order to control the pollution from abandoned mines, it is necessary that the Federal Government participate in the financing of the projects. The Federal Government financial participation would be dependent upon the programs and statutory requirements of the individual states.

D. It shall be the responsibility of the individual states to develop the specific engineering abatement plans for a project.

E. The states should acquire any necessary leases and rights of entry upon private property for the purpose of reclamation and maintenance.

F. The states must develop and implement a program for the operation and maintenance of the seals, drainage ditches, treatment facilities, etc.

It is necessary that a committee or compact (possibly ORSANCO) be developed to coordinate the necessary remedial action. The purposes of this group would be as follows:

A. Review and approve all applications for Federal assistance.

B. Coordinate the remedial programs of the states.

C. Continuously review the progress made by the individual states in the field of abatement of mine drainage from active mines.

D. Prepare progress reports for submission to the states and Congress.

E. Coordinate and if necessary, do the monitoring of water quality of streams in the basin.

F. Publish and distribute technical papers pertaining to the knowledge attained from the remedial projects.

If you have any further questions, please do not hesitate to contact this office.

Very truly yours,

Michael L. Rodevick

Michael L. Rodevick, P. E.
District Engineer

MLR/ral

cc: Mr. Walter N. Heine
Mr. Robert K. Horton
Mr. Edgar Henry

COMMONWEALTH OF PENNSYLVANIA

DEPARTMENT OF HEALTH
P. O. BOX 90
HARRISBURG 17120

THOMAS W. GEORGES, JR., M.D.
SECRETARY OF HEALTH

March 31, 1969

Don L. Warner, Ph.D.
Chief, Earth Sciences
Technical Programs Branch
Office of Operations, Ohio Basin Region
Federal Water Pollution Control Administration
U. S. Department of the Interior
Room 7027, Federal Office Building
550 Main Street
Cincinnati, Ohio 45202

Dear Don:

As was agreed during the February meeting of the Technical Committee, we submit the following proposed Recommendations to become part of the Monongahela River Basin Report for submission to the Enforcement Conference.

1. It is recommended that the member states submit to the FWPCA the details of a specific program whereby the states will control water pollution from active mines and proposed mines so as to prevent present and future pollution. Such a program must prevent pollution during and after mining and must be supported by adequate laws, regulations, and staff.

2. A remedial program for the abatement of pollution from abandoned mines should be promptly undertaken by the member states. Such a program should be funded by a 75% contribution of Federal funds and 25% of state funds. Federal funding should only be available for those states which have submitted and received approval and implemented programs for the control of mine drainage pollution from active mines.

    a. The states should initiate the development of abatement plans in those "quick start" areas set forth in the report as being obviously technically feasible and having good cost/benefit ratios.

    b. The Technical Committee should be directed to develop a priority list for those watersheds on the Basin based primarily on favorable cost/benefit ratios.

    c. Upon completion of the "quick start" plans, abatement projects at these locations should be initiated.

d. The states should undertake the development of abatement plans for the balance of the watershed proceeding down the priority list.

e. The effects of the "quick start" projects on the receiving streams should be continually monitored from both a chemical and biologic standpoint.

f. Projects to implement the abatement plans should be initiated as the plans are completed and funds allocated.

g. The states should acquire any necessary leases and rights of entry onto private land for surveys and construction of abatement facilities or reclamation measures.

3. It is recommended that the member states develop a program for maintenance and operation of abatement facilities and reclamation measures.

4. It is recommended that a Remedial Project Control Committee be established to assure that pollution abatement on the Monongahela River Basin proceeds expeditiously and that all states diligently carry out their responsibilities in making the program a success. Among other things, this Committee would:

   a. Review the progress of the remedial program.

   b. Solve common problems brought to it by the member states.

   c. Establish a priority list of abatement projects.

   d. Coordinate the planning and abatement activities of the member states.

   e. Monitor stream quality.

   f. Prepare periodic progress reports for submission to the states and to Congress.

   g. Acquire land access clearances where the states were unable to do so.

   h. Periodically publish technical papers to disseminate the knowledge attained from the remedial project.

We feel that the remedial project could be quite effective if these Recommendations are followed without the need for establishing a water basin compact. We recognize, however, that when the details of such a project are more closely reviewed, that our legal minds may decide that a watershed compact or commission may be necessary.

If you have any questions regarding our Recommendations, do not hesitate to contact me.

Under separate cover, I am forwarding for your information "Report of Phase I - Youghiogheny River Basin Mine Drainage Pollution Abatement Project".

Sincerely yours,

Walter N Heine

Walter N. Heine, Director
Division of Mine Drainage

STATE OF WEST VIRGINIA
DEPARTMENT OF NATURAL RESOURCES
CHARLESTON 25305

T. R. SAMSELL
DIRECTOR

DAVID C. CALLAGHAN
DEPUTY DIRECTOR

April 10, 1969

Mr. Don L. Warner,
Office of Operations, Ohio Basin Region
Federal Water Pollution Control Administration
U. S. Department of the Interior
Room 7027, Federal Office Building
550 Main Street
Cincinnati, Ohio 45202

Reproduced from best available copy.

Dear Mr. Warner:

In compliance with the agreement reached at the February meeting of the Technical Committee the recommendations of the committee member from West Virginia are submitted. It is understood that the appropriate recommendations submitted by the Committee members will be made a part of the Monongahela River Basin Report to the Enforcement Conference.

Recommendations from the State of West Virginia are as follows:

1. The Federal Water Pollution Control Administration, through its contacts with the participating states, select a number of sites for demonstration projects. These sites are to be selected based on technical feasibility, projected benefits and such other criteria as may be appropriate. The purpose of the projects would be to show the effects of implementation of certain techniques, both established and untried, on the quality of the affected waters. The total cost of such projects would be borne by the Federal government.

2. Relative to active mines the states would submit to the Federal Water Pollution Control Administration information to show their legal responsibilities and authorities under State statutes. Included with this material would be such rules and regulations enacted to implement the pollution control agency's actions. The states pollution abatement program would also be included in this information to round out the State's intent relative to active mines.

3. Control of drainage from inactive mines by such program as the State has in existence is to be defined. Development and implementation of the State's program for pollution control from inactive mines is to be funded by federal and state funds based on an equitable formula as to the federal-state ratio. Services or funds expended by the state would be considered of equal value for the purpose of matching federal funds.

4. An entity to carry the remedial action from the stage developed by the Technical Committee through program implementation should be selected by the Conference.

5. Such state and federal legislative action as is deemed necessary to bring about abatement of water pollution from active and inactive coal mines should be enacted to result in an equitable and effective program.

If you have any questions or if I can be of service, please let me know.

Very truly yours,

WATER RESOURCES DIVISION

Edgar N. Henry, Chief

OHIO RIVER VALLEY
WATER SANITATION COMMISSION
414 WALNUT STREET, CINCINNATI, OHIO 45202

M. K. McKAY
CHAIRMAN
ROBERT K. HORTON
EXECUTIVE DIRECTOR
AND CHIEF ENGINEER

June 19, 1969

Dr. D. L. Warner, Chief
Mine & Land Drainage Unit
Ohio Basin Region - FWPCA
Room 7027, Federal Office Building
Cincinnati, Ohio 45202

Dear Don:

With regard to the report of the Monongahela River Technical Committee, following are our thoughts on points that should be covered in the recommendations. Perhaps some of these may justify modification after we have reviewed the proposed "remedial program," which is now under development.

1. Control measures, including treatment where necessary, should be imposed immediately on discharges from all active mines. Upon cessation of mining, steps should be taken, including sealing and other measures, to prevent the occurrence of future pollution.

2. The states should take steps promptly to require that appropriate plans for preventing pollution are submitted by mining operators prior to the time that permits are granted for the opening of new mines or the re-opening of old mines.

3. A system for establishing priorities for attacking the abandoned-mine problem should be devised. Who should do this is not clear to us at the moment, since we do not know how far the Technical Committee itself will go toward devising such a system. The objective in establishing priority schedules should be to select areas where the greatest good can be done for the least expenditure. Further, a priority system should take into account the extent and severity of pollution from sources other than mine drainage and plans for dealing with those sources.

(more)

June 19, 1969

Dr. Don Warner

4. After the report of the Technical Committee is completed, this committee or some comparable group appointed by the Conferees should be maintained on a continuing basis. The continuing committee would be charged with the task of adjusting the initial schedule of priorities, taking into account plans and programs of the individual states, the Appalachian Regional Commission, the Corps of Engineers and other agencies. In addition, the committee would be concerned with periodic review and updating of priorities, as these may be affected by implementation of control programs and other changing conditions.

5. A policy should be enunciated that programs for abating pollution from abandoned mines should be financed with public funds -- state and federal. The question of what might represent an appropriate ratio of state and federal funding is open to discussion.

6. A study should be made to outline possibilities of new institutional arrangements for implementing control programs dealing with the mine drainage problem. Such a study should illuminate means for more effective coordination among state agencies, ORSANCO and federal agencies concerned with the problem.

7. Continuing research should be encouraged. For example, a search for more efficient and therefore less costly procedures for sealing mines would appear worthy of attention. In addition, a search for improved techniques for neutralizing mine discharges would also appear worthwhile.

Sincerely yours,

ROBERT K. HORTON
Executive Director
and Chief Engineer

RKH/rb

cc: Mr. A. D. Sidio
Mr. Edgar N. Henry
Mr. Walter A. Lyon
Mr. Walter N. Heine
Mr. Michael L. Rodevick

# ATTACHMENT C

# TO

# MONONGAHELA RIVER
# MINE DRAINAGE
# SUMMARY REPORT

## STATUS OF ACTIVE MINES
## IN THE MONONGAHELA BASIN

270<

Sub-Basin #1
Lower Monongahela
Pennsylvania

| Inventory Number | Company Name & Mine Name | Location | Type of Mine | Field Inventory Data (1967-68) Flow gpm | pH | Acid mg/l | Acid lb/day | Iron mg/l | Iron lb/day | Treatment Provided & Remarks (1) (2) Flow gpm | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 5-029 | Jones & Laughlin Steel Vesta #4 | Under Pike Run, in Washington Co.; coal brought out at Vestaburg, Pa. | Shaft & Drift | 121 | 3.5 | 280 | 409 | 9.8 | 14 | 122 | Richeyville Shaft, dry since permit |
| | | | | 1042 | 6.3 | -322 | -4035 | 28.8 | 361 | 1042 | Berick B.H., aeration & settling, alkaline discharge |
| | | | | 14 | 6.2 | -188 | -31 | 1.2 | 0 | 69 | Smallwood Drift, alkaline discharge, no treatment |
| 5-062 | Bell Coal Co., the old Crescent or Eclipse mines | North of mouth of Pike Run, 5 miles south of Charleroi, Pa. | Drift | 21 | 6.6 | -240 | -61 | 0.0 | 0 | | No treatment needed. |
| | | | | | Average of two samples | | | | | | |
| 5-132 | Protz Bros. | 1 mile south of Charleroi, Pa. | Strip | 104 | 6.6 | -52 | -65 | 0.0 | 0 | | |
| | | | | | Average of six samples | | | | | | |
| 5-142 | M. Sustrik | 0.2 mile NW of Walkertown School on Pike Run, Pa. | Farm Mine | 60 | 2.9 | 307 | 222 | 11.2 | 8 | - | |
| 12-005 | Bethlehem Mines Ellsworth #51 mine | Ellsworth, Pa. | Shaft | 1154 | 4.5 | 919 | 5138 | 298.1 | 2316 | 1410 | Treatment provided at shaft near Twin Lakes: other discharge point also exists |
| | | | | | Average of four samples | | | | | | |
| 13-020 | Victory Coal Co. mine Possibly mined for house coal | South end of Donora, Pa. | Drift | 40 | 5.6 | 142 | 69 | 0.1 | 0 | - | |
| | | | | | Average of five samples | | | | | | |
| 15-051 | Sager Coal Co. | 1.4 miles NNW of Large, Pa. | Drift | 16 | 10.0 | 44 | 8 | 0.1 | 0 | | Treated with hydrated lime to meet state standards. |
| 25-001 | U.S. Steel Maple Creek Mine | New Eagle, Pa. | Preparation Plant | 4 | 7.1 | -138 | -7 | 1.3 | 0 | - | Flow from refuse pile and slurry ponds. |
| 25-002 | Mathies Coal Co.; Mathies Mine | North of mouth of Mingo Creek in Washington Co., Pa. | Preparation Plant | 81 | 6.4 | 62 | 61 | 7.4 | 7 | - | Flow from refuse pile and slurry ponds. |

Sub-Basin #1 (Continued)
Lower Monongahela
Pennsylvania

| Inventory Number | Company Name & Mine Name | Location | Type of Mine | Field Inventory Data (1967-68) Flow gpm | pH | Net Acid mg/1 | Net Acid lb/day | Iron mg/1 | Iron lb/day | Treatment Provided & Remarks (1) (2) Flow gpm | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 25-008 | Jim Brounce | Near mouth of Mingo Creek in Washington Co., Pennsylvania | Drift | ½ | 3.1 | 1375 | 8 | 20.8 | 0 | - | farm mine |
| 25-044 | Mathies Coal Co.; Mathies Mine | Under Mingo Creek in Washington Co.: coal brought out at Creek mouth | Shaft & Drift | 293 | 5.1 | 121 | 717 | 73. | 294 | - | flows from pitmouths & borehole |
| | | | | Average of four samples (3) | | | | | | | |
| | | | | 33 | 7.8 | -471 | -189 | 24.0 | 10 | 416 | Thomas shaft: aeration & settling |
| | | | | 200 | 5.6 | 391 | 939 | 210.0 | 504 | 555 | Mingo shaft: lime neutralization, aeration & settling |
| 25-049 | Miller Savage | 0.4 miles W. of Charleroi, Pa. | Strip & Drift | 4 | 2.8 | 1992 | 41 | 348.0 | 5 | - | |
| | | | | Average of two samples (3) | | | | | | | |
| 25-083 | G. Rathger | ½ mile South of Bunola, Pa. | Strip | ½ | 8.7 | -79 | 0 | 0.2 | 0 | - | no treatment needed |
| 25-123 | U. S. Steel; Maple Creek Mine | Between Mingo & Pigeon Creeks in Washington Co.; coal brought out at New Eagle, Pa. | Shaft & Drift | 50 | 7.5 | -198 | -119 | 12.5 | 8 | - | New Eagle drift: flows now diverted to Ginger Hill |
| | | | | 500 | 7.0 | -637 | -3835 | 12.0 | 72 | 500 | Hazel Kirk Slope: no treatment required |
| | | | | | | | | | | 3000 | Ginger Hill Plant: settling |

Sub-Basin #2
Redstone Creek & Dunlap Creek
Pennsylvania

| Inventory Number | Company Name & Mine Name | Location | Type of Mine | Field Inventory Data (1967) | | | | | | Treatment Provided & Remarks (1) (2) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Flow | | Net Acid | | Iron | | Flow | |
| | | | | gpm | pH | mg/1 | lb/day | mg/1 | lb/day | gpm | |
| 20-300 | C. Carbona | 1.2 miles E. of Searights, Pa. | Strip | ½ | - | 1151 | 7 | 0.7 | 0 | | |
| 20-312 | W. Piccolomini | S. side of Bolden Run at Waltersburg, Pa. | Strip | 2 | 5.0 | -118 | -3 | 0.9 | 0 | | |
| 34-200 | Pontorero & Sons Coal Co. | 0.8 mile E. on Brownfield, Pa. road from US 119 | Strip | 68 | 3.1 | 2270 | 1863 | 348.0 | 284 | | Water from sandstone above coal & runs over spoil |

Sub-Basin #3
Tenmile Creek
Pennsylvania

| Inventory Number | Company Name & Mine Name | Location | Type of Mine | Field Inventory Data (1967) | | | | | | Treatment Provided & Remarks (1) (2) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Flow gpm | pH | Net Acid mg/l | Net Acid lb/day | Iron mg/l | Iron lb/day | Flow gpm | |
| 1-009 | Jones & Laughlin Steel<br>Vesta #5 Mine | Vestaburg to Lone Pine, Pa.: Washington Co. | Shaft and Drift | 35 | 6.5 | 115 | 48 | 120.0 | 50 | 347 | Kefover shaft; usually dry |
| | | | | 104 | 7.6 | -89 | -112 | 180.0 | 226 | 208 | Thompson BoreHole; storage lagoon, lime neutralization, aeration & settling. |
| | | | | 65 | 4.2 | 260 | 217 | 23.5 | 20 | - | Hastings Bore Hole |
| 12-002<br>12-004 | Bethlehem Mines Corp.<br>Marianna #58 | Marianna, Pa.: Washington Co. | Preparation Plant & Shaft | 94 | 7.8 | 364 | 41 | 0.4 | 0 | 208 | Total discharge usually used up in preparation plant which also neutralizes the water in case an excess is created. |
| 21-020 | Unknown | S. side of S. Fork Ten Mile Creek 0.7 mile downstream of mouth of Ruff Creek | Drift | 14 | 3.0 | 580 | 100 | 98.4 | 17 | - | Farm type mine, may be intermittently active |
| 21-025 | Unknown | N.E. bank of S. Fork Ten Mile Creek on sharp bend-1.2 mile downstream of Ruff Creek | Drift | 12 | 5.3 | 217 | 31 | 57.6 | 8 | - | Farm type mine; Waynesburg coal |
| 21-036 | W. Harbauch | Black Dog Hollow near mouth of Ten Mile Creek, Pa. | Drift | 5 | 6.2 | -66 | -4 | 7.2 | 0 | - | Farm type mine |
| 21-044 | P & A Coal Co. | S.W. side of U.S. Route 88 as it crosses Ten Mile, Pa. | Slope | 250 | 5.0 | 100 | 300 | 10.0 | 30 | | Two holding ponds |
| 21-047 | Tremont Mining Co.<br>Clyde #2 Mine | Pitt Gas on Ten Mile Creek, Pa. | Slope | none | - | - | - | - | - | 69 | No treatment needed; inactive at time of inventory |
| 21-061 | Jones & Laughlin Steel<br>Gateway Mine | Between Ruff Creek and the N. Fork of Ten Mile Creek, Pa. | Shaft | 416 | 5.8 | -97 | -486 | 24.0 | 120 | 416 | Edwards Shaft: no treatment needed |
| | | | | 120 | 5.8 | -106 | -153 | 3.2 | 5 | - | Tipple Slope |
| | | | | 139 | 6.7 | -292 | -488 | 1.1 | 2 | 139 | Grimes Shaft & Bore Hole: usually dry |

Sub-Basin #3
Tenmile Creek
Pennsylvania

| Inventory Number | Company Name & Mine Name | Location | Type of Mine | Field Inventory Data (1967-68) | | | | | | Treatment Provided & Remarks (1) (2) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Flow gpm | pH | Net Acid mg/l | Net Acid lb/day | Iron mg/l | Iron lb/day | Flow gpm | |
| 21-064 | Republic Steel Corp. Clyde #3 Mine | S.E. of Marianna, Pa. | Shaft and Drift | 100 | 6.8 | -234 | -282 | 72.0 | 87 | 100 | Clyde #3 Shaft: settling pond |
| | | | | 167 | 6.4 | -164 | -330 | 612.0 | 1231 | 750 | Borehole at Fairfield: |
| | | | | 104 | 5.8 | 130 | 163 | 148.8 | 186 | - | Borehole at 1.3 miles above S. Fork confluence: abandoned Sept. 1968 |
| 5-029 | Jones & Laughlin Steel Corp. Vesta #4 | Vestaburg to Beallsville, Pa. | Shaft | 69 | 6.0 | 129 | 108 | 60.0 | 50 | - | Hickerson Shaft: abandoned July 1967 |

Sub-Basin #4
Middle Monongahela
Pennsylvania

| Inventory Number | Company Name & Mine Name | Location | Type of Mine | Field Inventory Data (1965-68) Flow gpm | pH | Net Acid mg/l | Net Acid lb/day | Iron mg/l | Iron lb/day | Treatment Provided and Remarks (1) (2) Flow gpm | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1-009 | Jones & Laughlin Steel Corp. Vesta #5 mine | Vestaburg to Lone Pine, Pa., Washington County | Drift & Shaft | 122 | 6.3 | -162 | -238 | 1.2 | 2 | 138 | Supply Yard Drifts: no treatment needed |
| | | | | 69 | 4.2 | 260 | 217 | 23.5 | 20 | | Hastings |
| 5-001 | Jones & Laughlin Steel Corp. Vesta & Shannopin Mines | Across river from Vestaburg, Pa. | Preparation Plant | 45 | 7.6 | -391 | -212 | 3.9 | 2 | | Flow through tailings pond dam |
| 5-029 | Jones & Laughlin Steel Corp. Vesta #4 Mine | Beallsville, Pa. Washington County | Drift & Shaft | 69 | 6.5 | -322 | -269 | 28.8 | 24 | | 17 Butt 11 Face Borehole |
| 5-096 | United States Steel Corp. Karen Mine | 0.3 mile E. of Vestaburg, Pa., Washington County | Drift | 347 | 5.3 | 1142 | 163 | 33.5 | 1 | | Water treatment plant under construction |
| | | | | | Average of four samples (3) | | | | | | |
| 20-004 | Buckeye Coal Co. Nemacolin Mine | Nemacolin, Pa. Mile Point 76.7 on Monongahela River | Preparation Plant | 67 | 3.5 | 1145 | 924 | 42.5 | 34 | | Flow through tailings pond dam & coarse gob |
| | | | | | Average of two samples (3) | | | | | | |
| 20-005 | Duquesne Light Co. | Mile Point 83 on Monongahela River N. of Greensboro, Pa. | Preparation Plant | 30 | 3.8 | 810 | 293 | 64.5 | 23 | | Flow through tailings pond dam & coarse refuse |
| | | | | | Average of two samples (3) | | | | | | |
| 20-006 | United States Steel Corp. Robena Mine | Mouth of Whiteley Creek Greene County, Pa. | Preparation Plant | 35 | 3.1 | 2063 | 869 | 728.3 | 307 | | Flow through tailings pond dam & coarse refuse |
| | | | | | Average of three samples (3) | | | | | | |
| 20-007 | Republic Steel Corp. | Mile Point 63.4 on Monongahela River at Millsboro, Pa. | Preparation Plant | 60 | 7.4 | -117 | -85 | 0.0 | 0 | | |
| 20-008 | National Mines Corp. | Isabella, Pa. Mile Point 71.9 on Monongahela River | Preparation Plant | 60 | 4.5 | 384 | 277 | 22.6 | 16 | | Flow through tailings pond dam & coarse refuse |

Sub-Basin #4 (Continued)
Middle Monongahela
Pennsylvania

| Inventory Number | Company Name & Mine Name | Location | Type of Mine | Field Inventory Data (1965-68) Flow gpm | pH | Net Acid mg/l | Net Acid lb/day | Iron mg/l | Iron lb/day | Treatment Provided and Remarks (1) (2) Flow gpm | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 20-101 | United States Steel Corp. Robena Mines | Under Whiteley Creek near Masontown, Pa. | Shaft & Slope | 395 | 3.1 | 800 | 3804 | 268.8 | 1278 | 1069 | Whiteley Borehole: no treatment |
| | | | | 50 | 7.8 | -144 | -87 | 0.6 | 0 | 200 | Bowlby Shaft: no treatment needed |
| | | | | 83 | 7.3 | -256 | -254 | 0.6 | 1 | 1056 | Garards Fort Borehole: no treatment needed |
| | | | | 33 | - - - | - - - | - - - | - - - | - - - | - - - | Robena Slope: water all used in preparation plant |
| | | | | 198 | 7.3 | -321 | -766 | 1.8 | 4 | 200 | Frosty Run Shaft: no treatment needed |
| | | | | 19 | 7.3 | -606 | -138 | 1.9 | 0 | | Blaker Shaft |
| 20-118 | Duquesne Light Co. Warwick #1 Mine | 1 mile N.W. of Greensboro, Pa. | Drift & Shaft | 34 | 2.8 | 1000 | 409 | 60.0 | 25 | | |
| 20-119 | Duquesne Light Co. Warwick #2 Mine | Area 1 to 2 miles N.W. of Greensboro, Pa. | Drift & Shaft | | | | | | | 1542 | Blackshire shaft: lime neutralization, aeration & settling. |
| | | | | 1200 | 3.2 | 970 | 14017 | 278.4 | 4023 | | 5 North Borehole |
| | | | | 14 | 2.2 | 9450 | 1592 | 197.4 | 33 | | Route 88 Pond & Borehole |
| 20-137 | Genovese Mining Co. | 2 miles E. of Greensboro, Pa. | Strip & Drift | 26 | 2.9 | 1567 | 478 | 276.3 | 84 | | Water from stripped out workings to a deep mine |
| | | | | Average of four samples (3) | | | | | | | |
| 20-138 | Genovese Mining Co. & Paul Pontierro Mining Co. | 1 mile E. of Greensboro, Pa. | Strip & Drift | 131 | 2.9 | 1668 | 2621 | 256.4 | 403 | | Water from stripped out workings to a deep mine |
| | | | | Average of five samples (3) | | | | | | | |
| 20-148 | Genovese Mining Co. | 2.1 miles S. of Greensboro, Pa. | Strip & Drift | 8 | 3.2 | 1345 | 121 | 84.0 | 8 | | Water from stripped out workings to a deep mine |
| | | | | Average of two samples (3) | | | | | | | |
| 20-352 | National Mines Corp. Crucible & Isabella Mines | Area around Crucible and Isabella, Pa. & S. to Carmichaels, Pa. | Shaft | 2800 | 6.5 | -921 | -23076 | 15.6 | 391 | 2083 | Isabella Bottom |
| | | | | 690 | 6.2 | -147 | -1222 | 120.0 | 998 | | 40 North Borehole |
| | | | | 2800 | 5.9 | -147 | -3683 | 38.6 | 967 | | 70 South Borehole |
| | | | | 120 | 6.5 | -479 | -673 | 0.2 | 0 | | Carmichaels Deep Well |

Sub-Basin #4 (Continued)
Middle Monongahela
Pennsylvania

| Inventory Number | Company Name & Mine Name | Location | Type of Mine | Field Inventory Data (1965-68) Flow gpm | pH | Net Acid mg/l | Net Acid lb/day | Iron mg/l | Iron lb/day | Treatment Provided and Remarks (1) (2) Flow gpm | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 20-352 (Continued) | | | | 63 | 6.9 | -479 | -362 | 0.2 | 0 | 200 | 5 East Borehole: no treatment needed |
| | | | | 108 | 7.0 | -564 | -731 | 1.8 | 2 | 292 | Crucible Bottom |
| 20-362 | Buckeye Coal Co.<br>Nemacolin Mine | Area W & NW of Nemacolin to Carmichaels, Pa. | Shaft | 28 | 5.5 | -23 | -8 | 0.8 | 0 | 17 | No. 2 Shaft: no treatment needed |
| | | | | 101 | 6.8 | -939 | -1391 | 3.1 | 5 | 140 | No. 8 South Road Borehole: no treatment needed |
| | | | | | | | | | | 146 | No. 3 Shaft: no treatment needed |
| | | | | 344 | 7.6 | -152 | -630 | 2.2 | 9 | 296 | No. 4 Shaft: no treatment needed |
| | | | | 584 | 5.7 | -23 | -161 | 0.8 | 6 | 608 | 1st South Borehole: no treatment needed |
| | | | | 86 | 7.5 | -916 | -950 | 3.6 | 4 | 148 | No. 1 Shaft: settling ponds for iron |
| | | | | 113 | 7.4 | -916 | -1493 | 3.6 | 6 | | No. 8 Road North Borehole: no treatment needed |
| | | | | 378 | 7.6 | -152 | -691 | 2.2 | 11 | | No. 4 Shaft No. 1 Borehole: no treatment needed. |
| 20-380 | | 4.5 miles S.W. of Uniontown, Pa. | Strip & Drift | 1448 | 4.6 | 237 | 2778 | 38.2 | 569 | | |
| | | | | | Average of four samples (3) | | | | | | |
| 20-382 | E. Miller | 4.5 miles W.S.W. of Uniontown, Pa. | Strip & Drift | 6 | 3.4 | 605 | 43 | 46.8 | 3 | | |
| 20-390 | | 2.1 miles E. of Masontown, Pa. | Strip & Drift | 9 | 2.8 | 1915 | 208 | 212.4 | 23 | | |
| 20-397 | Bartoni Coal Co. | 3.8 miles E.S.E. of Masontown, Pa. | Strip | 20 | 3.1 | 2202 | 100 | 361.2 | 51 | | |
| | | | | | Average of two samples (3) | | | | | | |

Sub-Basin #4 (Continued)
Middle Monongahela
Pennsylvania

| Inventory Number | Company Name & Mine Name | Location | Type of Mine | Field Inventory Data (1965-68) Flow gpm | pH | Net Acid mg/l | Net Acid lb/day | Iron mg/l | Iron lb/day | Treatment Provided and Remarks (1) (2) Flow gpm |
|---|---|---|---|---|---|---|---|---|---|---|
| 20-401 | Menallen Coke & Coal Co. | 4.9 miles E.S.E. of Masontown, Pa. | Strip & Drift | 638 | 2.9 | 2267 | 22401 | 243.3 | 3288 | |
| | | | | | Average of twelve samples (3) | | | | | |
| 20-407 | W. Piccolomini & Soberdash Coal Companies | 5 miles S.S.W. of Uniontown, Pa. | Strip & Drift | 60 | 3.3 | 895 | 647 | 69.1 | 50 | |
| 20-412 | Ganeer Coal Co. | 4.7 miles E.S.E. of Greensboro, Pa. | Drift | 5 | 2.4 | 2710 | 170 | 768.0 | 48 | |
| 20-413 | R. J. Smith Coal Co. | 5.4 miles E.S.E. of Greensboro, Pa. | Strip & Drift | 0.5 | 2.9 | 1930 | 12 | 32.4 | 0 | |
| | | | | | Average of two samples (3) | | | | | |

Sub-Basin #5
Dunkard Creek
Pennsylvania & West Virginia

| Inventory Number | Company Name & Mine Name | Location | Type of Mine | Field Inventory Data Flow gpm | pH | Net Acid mg/l | Net Acid lb/day | Iron mg/l | Iron lb/day | Treatment Provided & Remarks (1) (2) Flow gpm | (4) (5) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 20-037 | G. Prasock | 4.3 miles W. of Greensboro, Pa. | Drift | 2 | 4.4 | 300 | 7 | 72.0 | 2 | | |
| 38-075 | Big D Coal Co. | 4.4 miles W. of Point Marion, Pa. | Drift | 1 | 4.0 | 379 | 6 | 53.5 | 1 | 1 | No treatment needed usually |
| 38-076 | Chess Mining Co. | 50 miles W. of Point Marion, Pa. | Drift | 43 | 5.1 | -171 | -89 | 19.4 | 10 | | |
| 38-085 | Robinson Run Coal Co. old Maiden Mine | N.W. quarter of Morgantown, North quadrangle, W.Va. | Drift | 82 | 3.9 | 1952 | 1895 | 529.2 | 508 | | Interstate mine:also in sub-basin #6 |
| 44-051 | Christopher Coal Co. Osage #3 Mine | Between Scotts Run & Dents Run, W. of Morgantown, W. Va. | Shaft & Drift | 17 | 7.2 | -877 | -179 | 384.0 | 78 | | #87, Core discharge:aeration & pond, flow then through old mine to discharge point #84 |
| | | | | 104 | 3.7 | 825 | 1034 | 144.0 | 180 | | #79 discharge |
| | | | | none | | | | | | | #88, Pedlar Run discharge: aeration & pond |
| | | | | none | | | | | | | #93, Statler Shaft discharge; flow regulation |
| 44-055 | Christopher Coal Co. Humphry #7 Mine | N.W. & S.E. of Mount Morris, Pa. | Shaft & Drift | 248 | 6.9 | -636 | -1897 | 24.0 | 72 | 69 | #85, Mount Morris discharge: aeration, pond, flow regulation Pa. permit |
| | | | | 42 | 5.8 | -542 | -272 | 0 | 0 | 416 | #P4, Bowers Shaft discharge: holding pond, Pa. permit |
| | | | | none | | | | | | 138 | #P5, Calvin Run; holding pond, Pa. permit |
| | | | | none | | | | | | 416 | #P3, on Bacon Run; Pa. permit |

Sub-Basin #5 (continued)
Dunkard Creek
Pennsylvania & West Virginia

| Inventory Number | Company Name & Mine Name | Location | Type of Mine | Field Inventory Data<br>Flow gpm | pH | Net Acid<br>mg/l | Net Acid<br>lb/day | Iron<br>mg/l | Iron<br>lb/day | Treatment Provided & Remarks (1) (2)<br>Flow gpm | (4) (5) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 44-070 | Jones & Laughlin Steel Corp. Shannopin Mine | Area around and N.W. of Shannopin, Pa. | Shaft & Drift | 521 | 4.0 | 1186 | 7428 | 243.0 | 1522 | 694 | #1 Borehole; Pa. permit |
| | | | | 500 | 7.2 | -835 | -5023 | 4.1 | 25 | 69 | #3 Shaft fan; Pa. permit |
| | | | | 15 | 3.5 | 414 | 75 | 36.0 | 6 | | #1 Shaft fan |
| | | | | 15 | 6.3 | 80 | 14 | 3.2 | 1 | | #1 Portal |
| | | | | | | | | | | 138 | Points on Meadow Run; Pa. permi |
| 44-042 | Christopher Coal Co. Pursglove #15 Mine | Between Scotts Run & Robinson's Run, N.W. of Morgantown, W. Va. | | none: mine closed down due to fire at time of inventory | | | | | | | #84, Fetty discharge: neutralization, aeration, flow regulation, ponds. |

Sub-Basin #6
Upper Monongahela
West Virginia

| Inventory Number | Company Name & Mine Name | Location | Type of Mine | Field Inventory Data (1965-68) Flow gpm | pH | Net Acid mg/l | Net Acid lb/day | Iron mg/l | Iron lb/day | Treatment Provided and Remarks (1) (4) Flow gpm | (5) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 28-009 | Mountaineer Coal Co. #93 Mine | Area N. of Rivesville, W. Va. | Shaft & Drift | 292 | 3.3 | 3000 | 10,507 | 870.0 | 3047 | | No. 3-93 to Pharoah Creek |
| | | | | 250 | | 3000 | 8,990 | 870.0 | 2607 | | No. 4-93 to Indian Creek |
| | | | | 40 | 7.5 | -434 | -208 | 1.2 | 1 | | No. 6-93 to Indian Creek: Hagans Shaft:pond |
| | | | | 40 | 3.3 | 2070 | 992 | 762.0 | 365 | | No. 9-93 to Indian Creek |
| | | | | 500 | | -434 | -2601 | 1.2 | 7 | | No. 5-93 to Indian Creek |
| 36-072 | Reliable Coal Co. | 2.3 miles S.W. of Masontown, W. Va. | Drift | 15 | 3.3 | 120 | 22 | 3.9 | 1 | | |
| 36-073 | Daugherty Coal Co. | 2.5 miles S.W. of Masontown, W. Va. | Strip | 18 | 2.8 | 1525 | 324 | 144.0 | 31 | | |
| 38-001 | Christopher Coal Co. Arkwright #1 & Osage #3 | Granville, W. of Morgantown, W. Va. | Preparation Plant | 30 | 6.1 | -11 | -4 | 0.2 | 0 | | Flow through tailings pond dam overflow |
| 38-002 | Christopher Coal Co. Humphrey #7 & Purslglove #15 | N.E. of Bertha Hill, N.W. of Morgantown, W. Va. | Preparation Plant | 120 | 4.4 | -8 | -12 | 1.1 | 2 | | |
| 38-085 | Robinson Run Coal Co. old Maiden Mine | N.W. quarter of Morgantown North quadrangle, W. Va. | Drift | 16 | 3.0 | 5230 | 990 | 1386.0 | 262 | | |
| 38-234 | B. Wall | Pierpont, W. of Morgantown, W. Va. | Drift | 1 | 3.3 | 7502 | 89 | 230.4 | 27 | | |
| 38-274 | R. Chess | 1.5 miles S.E. of Point Marion, Pa., in W. Va. on Camp Run | Strip | 1 | 3.3 | 2618 | 23 | 60.0 | 1 | | |

Sub-Basin #6 (continued)
Upper Monongahela
West Virginia

| Inventory Number | Company Name & Mine Name | Location | Type of Mine | Field Inventory Data (1965-68) Flow gpm | pH | Net Acid mg/l | Net Acid lb/day | Iron mg/l | Iron lb/day | Treatment Provided and Remarks (1) (4) Flow gpm | (5) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 38-288 | W. T. Lyons | E. of Pleasant Hill School in W. Va., 2.0 miles S. of Point Marion, Pa. | Drift | 2 | 3.3 | 3300 | 96 | 888.0 | 26 | | |
| 38-355 | Laneskie Coal Co. | Walnut Hill, W. of Point Marion, Pa. | Drift | ⅓ | 2.9 | 6002 | 23 | 1428.0 | 6 | | |
| | | | | Average of two samples (3) | | | | | | | |
| 39-020 | P. Poncetori or McMillan | 4.5 miles S.E. of Morgantown, W. Va. | Strip | 1 | 2.9 | 862 | 10 | 0.9 | 0 | | |
| 44-015 | Dipple & Dipple Coal Co. | 2.4 miles S.W. of Mount Morris, Pa. in W. Va. | Strip & Auger | 2 | 7.3 | -146 | -4 | 2.0 | 0 | | |
| 44-020 | L & M Coal Co. | 3.1 miles N. of Osage, W. Va. | Drift | ⅓ | 3.2 | 1840 | 13 | 444.0 | 3 | | |
| 44-035 | G. Johnson | Osage, W. Va. | Strip | 1 | 2.8 | 4670 | 55 | 768.0 | 9 | | |
| 44-041 | Christopher Coal Co. Arkwright No. 1 Mine | Under Dents Run, W. of Morgantown, W. Va. | Shaft & Drift | 76 | 3.2 | 4560 | 4189 | 1422.0 | 1306 | | No. 1:discharge to Dents Run |
| | | | | 35 | 3.1 | 2830 | 1192 | 828.0 | 349 | | Near portal on Dents Run |
| | | | | 149 | 3.2 | 4480 | 8046 | 888.0 | 1595 | | No. 17: to Dents Run |
| | | | | 81 | 3.2 | 6510 | 6307 | 2400.0 | 2325 | | No. 4: Lynch Shaft to Little Indian Creek:Aeration & Pond |
| | | | | 69 | 3.4 | 2370 | 1980 | 58.8 | 49 | | No. 71: to trib to Dents Run |
| | | | | 182 | 3.3 | 7000 | 15301 | 1920.0 | 4197 | | Main Shaft on Dents Run |
| | | | | 28 | 6.1 | 360 | 120 | 216.0 | 72 | | No. 81: to Stewarts Run: Flow regulation, pond, periodic neutralization |

Sub-Basin #6 (continued)
Upper Monongahela
West Virginia

| Inventory Number | Company Name & Mine Name | Location | Type of Mine | Field Inventory Data (1965-68) | | | | | | Treatment Provided and Remarks (1) (4) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Flow gpm | pH | mg/1 | lb/day | mg/1 | lb/day | Flow gpm | (5) |
| 44-042 | Christopher Coal Co.<br>Pursglove #8 & 15 | Between Scotts Run & Robinson's Run N.W. of Morgantown, W. Va. | Shaft & Drift | 1097 | 4.0 | 2406 | 31761 | 487.2 | 6431 | | No. 16: to Scotts Run |
| | | | | 1/10 | 3.7 | 5980 | 6 | 1188.0 | 1 | | No. 14: at town of Jeve on Scotts Run |
| | | | | 347 | 4.4 | 2950 | 12323 | 744.0 | 3108 | | No 20: NW of Jere on Scotts Run |
| | | | | 19 | 3.2 | 4160 | 973 | 1416.0 | 331 | | No. 15: to Guston Run headwaters |
| 44-051 | Christopher Coal Co.<br>Osage No. 3 | Between Dents Run & Scotts Run N.W. of Morgantown, W. Va. | Shaft & Drift | 104 | 3.4 | 2250 | 2817 | 691.2 | 865 | | No. 13 to Dents Run |
| | | | | 75 | 2.7 | 5470 | 4936 | 1236.0 | 1115 | | No. 23 on old Company map to Dents Run |
| | | | | 515 | 2.8 | 4330 | 26843 | 888.0 | 5505 | | No. 10 to Dents Run |
| | | | | ½ | 4.0 | 4610 | 27 | 726.0 | 4 | | Seal to old No. 1 mine |
| | | | | ½ | 4.2 | 3430 | 30 | 710.4 | 6 | | Seal to old No. 1 mine |
| 44-055 | Christopher Coal Co.<br>Humphry No. 7 | N.W. & S.E. of Mount Morris, Pa. These openings in W. Va. | Shaft & Drift | 1000 | 4.7 | 990 | 11911 | 577.2 | 6944 | | No. 73 to Robinson Run |
| | | | | 69 | 3.1 | 635 | 530 | 61.2 | 51 | | No. 76 to Robinson Run |
| | | | | 28 | 3.1 | -128 | -43 | 0.7 | 0 | | No. 80 to Robinson Run |
| | | | | 35 | 7.5 | 3410 | 1425 | 1056.0 | 441 | | No. 74 to Robinson Run |
| 48-001 | Mountaineer Coal Co.<br>No. 93 Mine | Opposite Jordan, W.Va. Mile Point 117.9 on the Monongahela River | Preparation Plant | 113 | 5.8 | 405 | 19 | 56.4 | 3 | | Flow through tailings pond dams |
| | | | | Average of three samples (3) | | | | | | | |
| 48-002 | National Coal Co.<br>National Mine | National, W. Va. | Preparation Plant | 125 | 7.0 | -12 | -18 | 83.7 | 126 | | |

Sub-Basin #6 (continued)
Upper Monongahela
West Virginia

| Inventory Number | Company Name & Mine Name | Location | Type of Mine | Field Inventory Data (1965-68) Flow gpm | pH | Net Acid mg/1 | Net Acid lb/day | Iron mg/1 | Iron lb/day | Treatment Provided and Remarks (1) (4) Flow gpm | (5) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 48-005 | Christopher Coal Co.<br>Booth No. 6 Mine | 1 mile S. of main Arkwright #1 shaft on Little Indian Creek | Shaft & Drift | 556 | 3.6 | 2700 | 18046 | 888.0 | 5935 | | No. 82 discharge point |
| 48-032 | National Coal Co.<br>National Mine | National, W. Va. | Drift | 48 | 2.6 | 1583 | 568 | 357.6 | 84 | | Flows from portals |
| | | | | Average of three samples (3) | | | | | | | |
| 48-052 | West Coal Co. | 2.0 mile S.S.E. of National, W. Va. | Drift | 2 | 2.4 | 1280 | 23 | 120.0 | 36 | | |
| 48-073 | Fresam Coal Co. | Osgood, W. Va. | Drift | 28 | 4.1 | 442 | 150 | 128.4 | 44 | | |
| | | | | Average of two samples (3) | | | | | | | |
| 48-092 | Kamite | 1 mile W. of Rivesville, W. Va. | Strip & Drift | 9 | 2.7 | 7380 | 729 | 148.8 | 147 | | |
| 48-112 | Consolidation Coal Co. (leased from) old Montana Mine | Opposite Rivesville, W. Va. | Drift | 80 | 2.4 | 1005 | 969 | 58.5 | 56 | | |
| | | | | Average of two samples (3) | | | | | | | |

Sub-Basin #7
Buffalo and Paw Paw Creeks
West Virginia

| Inventory Number | Company Name & Mine Name | Location | Type of Mine | Field Inventory Data (1965-67) Flow gpm | pH | Net Acid mg/l | Net Acid lb/day | Iron mg/l | Iron lb/day | Treatment Provided and Remarks (1) (4) Flow gpm | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 22-001 | Bethlehem Mines No. 41 Mine | Barrackville, W. Va. | Preparation Plant | ¼ | 5.9 | 47 | 0 | 0.3 | 0 | | Flow through tailings pond dam |
| 22-150 | Bethlehem Mines No. 41 Mine | Barrackville, W. Va. & under Buffalo Creek | Shaft | 61 | 2.9 | 2340 | 1717 | 468.0 | 343 | | |
| | | | | 20 | 6.4 | -139 | -33 | 24.0 | 6 | | Borehole #2; ponds, aeration, and flow regulation |
| | | | | 175 | 6.4 | -369 | -777 | 180.0 | 379 | | Borehole #1; pond: water treated (pH control) and used in preparation plant. |
| 28-008 | Eastern Assoc. Coal Corp. Federal No. 1 Mine | Grant Town, W. Va. | Shaft | 37 | 7.4 | -472 | -21 | 8.4 | 0 | | Mayo shaft: aerator & pond |
| | | | | none | | | | | | | Keystone shaft: neutralization, aerator, & six ponds |
| 28-009 | Mountain Coal Co. No. 93 Mine | Baxter, W. Va. | Shaft & Drift | none<br>usually no flow | | | | | | | Pumpkin Center: aeration & two ponds<br>1-93 ) two large pumps - 1200 &<br>2-13 ) 1000 gpm along Paw Paw Creek |
| 35-001 | Eastern Assoc. Coal Corp. Joanne Mine | Rachel near Mannington, W. Va. | Preparation Plant | 3 | 5.8 | 254 | 9 | 138.0 | 5 | | Flow from refuse disposal area |
| 35-002 | Mountaineer Coal Co. No. 9 Mine | Consol No. 9, 4.5 miles N.E. of Mannington, W.Va. | Preparation Plant | 60 | 6.5 | 46 | -33 | 31.9 | 23 | | Flow from refuse disposal area |
| 35-003 | Mountaineer Coal Co. Loveridge Mine | 6.0 miles N.E. of Mannington, W. Va. | Preparation Plant | 60 | 6.0 | 41 | 28 | 37.2 | 27 | | Flow from refuse disposal area |
| 35-020 | Eastern Assoc. Coal Corp. Joanne Mine #59 | Rachel near Mannington, W. Va. | Shaft | 52 | 4.7 | 118 | 87 | 160.4 | 119 | | Aerator & Pond |
| 35-021 | Mountaineer Coal Co. No. 9 Mine | Consol No. 9, W. Va. | Shaft | 115 | 7.7 | -241 | -493 | 2.0 | 3 | | |
| | | | | Average of two samples (3) | | | | | | | |
| | | | | | | | | | | | Athas Run Pump; to Dunkard Mill Run |
| | | | | | | | | | | | Mod Run Pump; pond: to Buffalo Creek |

Sub-Basin #7 (Continued)
Buffalo and Paw Paw Creeks
West Virginia

| Inventory Number | Company Name & Mine Name | Location | Type of Mine | Field Inventory Data (1965-67) | | | | | | Treatment Provided and Remarks (1) (4) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Flow | | Net Acid | | Iron | | Flow | |
| | | | | gpm | pH | mg/l | lb/day | mg/l | lb/day | gpm | |
| 35-022 | Mountaineer Coal Co.<br>Loveridge Mine | 2.0 miles N.W. of Fairview, W. Va. | Shaft | 50 | 7.8 | -950 | -686 | 0.4 | 0 | | Sugar Run Shaft |
| | | | | 10 | 8.0 | -523 | -63 | 1.9 | 0 | | Dudley Pump; pond |
| | | | | | | | | | | | Harvey Run Pump: in Pa.; pond |

Sub-Basin #8 (Continued)
Lower West Fork
West Virginia

| Inventory Number | Company Name & Mine Name | Location | Type of Mine | Field Inventory Data (1965-67) |  |  |  |  |  | Treatment Provided & Remarks (1) (4) |  |
|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  |  |  | Net Acid |  | Iron |  | Flow |  |
|  |  |  |  | gpm | pH | mg/l | lb/day | mg/l | lb/day | gpm |  |
| 49-004 |  | 0.9 miles N. of Flemington, W. Va. | Drift | 10 | 2.8 | 1010 | 125 | 156.0 | 19 |  |  |
| 49-007 | Hill Top Coal Co. | 1.3 miles W.S.W. of Flemington, W. Va. | Drift | ½ | 3.2 | 1270 | 8 | 228.0 | 1 |  |  |
| 54-001 | Bethlehem Mines Corp.<br>Ida May No. 44 | Idamay, W. Va. | Preparation Plant | 50 | 6.3 | -103 | -62 | 0.8 | 0 |  | Water is treated for pH control & used in preparation plant. |
| 54-004 | Mountaineer Coal Co.<br>Williams Mine | 1 mile W. of Enterprise, W. Va. | Preparation Plant | 50 | 6.3 | -24 | -20 | 36.2 | 31 |  | Flow from refuse disposal area |
| 54-005 | Rochester & Pittsburgh Coal Co.<br>Four States Mine | Four States, W. Va. | Preparation Plant | 26 | 3.7 | 1581 | 485 | 792.0 | 243 |  | Plant breakdown when visited: slurry from plant dumped into creek was sampled. |
| 54-024 | Allen Coal Co. | 1.5 miles SW of Shinnston, W. Va. | Drift | 6 | 3.0 | 720 | 56 | 117.6 | 9 |  |  |
| 54-180 | Mountaineer Coal Co.<br>Owings Mine | Owings, W. Va. | Drift | 597 | 3.2 | 979 | 1519 | 142.4 | 364 |  | Should be mined out at present time |
|  |  |  |  | Average of six samples (3) |  |  |  |  |  |  |  |
| 54-185 | Mountaineer Coal Co.<br>Robinson Run Mine | 2.7 miles N.W. of Lumberport, W. Va. | Drift | 2 | 5.5 | 535 | 10 | 228.0 | 4 |  | New mine when visited |
| 54-186 | Mountaineer Coal Co.<br>Williams Mine | N.W. of Enterprise, W. Va. past Wyatt, W. Va. | Shaft | 1 | 7.2 | -122 | -2 | 2.8 | 0 |  |  |
|  |  |  |  | 6 | 3.0 | 1275 | 84 | 450.0 | 30 |  |  |
|  |  |  |  | 102 | 4.6 | 2710 | 3329 | 138.0 | 170 |  | Edgell Pump: aerator & pond: neutralization, aeration & pond for sludge repository. |
|  |  |  |  | 131 | 5.6 | 280 | 442 | 289.2 | 456 |  |  |
|  |  |  |  | 181 | 7.1 | -278 | -606 | 37.2 | 81 |  |  |
|  |  |  |  |  |  |  |  |  |  |  | Williams Mine: Main South pump & & Levi Moore pump @ Enterprise - neutralization, aeration, & settling pond. |

Sub-Basin #8
Lower West Fork
West Virginia

| Inventory Number | Company Name & Mine Name | Location | Type of Mine | Field Inventory Data (1965-67) Flow gpm | pH | Net Acid mg/1 | Net Acid lb/day | Iron mg/1 | Iron lb/day | Treatment Provided & Remarks (1) (4) Flow gpm | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 7-017 | Lockview Coal Co.<br>Mine No. 2 | Bear Mountain, W. of Brownton, W. Va. | Drift | 15 | 3.1 | 1218 | 160 | 480.4 | 45 | | |
| 7-037 | Maria Brothers | 1.0 mile S. of Brownton, W. Va. | Drift | 2 | 2.9 | 1830 | 40 | 710.0 | 15 | | |
| 7-063 | Hillside Coal Co.<br>Lawson Mine | 1.6 miles N. of Brownton, W. Va. | Drift | 65 | 3.0 | 988 | 774 | 182.0 | 143 | | |
| 14-189 | McCondlish Coal Co. | 4.0 miles S.E. of Lumberport, W. Va. | Drift | 1257 | 2.8 | 1410 | 21319 | 228.0 | 3447 | | Openings on Simpson Creek |
| | | | | 54 | 3.1 | 330 | 215 | 42.0 | 27 | | Openings on Simpson Creek |
| | | | | 92 | 3.0 | 850 | 942 | 120.0 | 133 | | Openings on Simpson Creek |
| 22-071 | Mountaineer Coal Co. | 2.8 miles S.S.W. of Monongah, W. Va. | Drift | ½ | 4.2 | 390 | 2 | 58.0 | 0 | | New mine |
| 27-041 | Slater | 5 miles S.W. of Grafton, W. Va. | Drift | 34 | 3.5 | 380 | 158 | 0.0 | 0 | | |
| 27-042 | Slater | 5.3 miles S.W. of Grafton, W. Va. | Drift | 26 | 2.8 | 375 | 120 | 48.7 | 16 | | |
| 27-049 | F. Borgus | 1.4 miles N.E. of Flemington, W. Va. | Drift | 2 | 2.8 | 1394 | 34 | 348.0 | 8 | | |
| 27-051 | Francis Coal Co. | 1.3 miles N.E. of Flemington, W. Va. | Drift | 5 | 2.7 | 1512 | 100 | 438.0 | 29 | | |
| 27-053 | | 2.0 miles N. of Flemington, W. Va. | Drift | 1 | 3.6 | 206 | 2 | 13.0 | 0 | | Domestic mine |
| 27-065 | Arvada Coal Co. | 0.4 miles N. of Flemington, W. Va. | Drift | 13 | 2.6 | 3708 | 573 | 1128.0 | 174 | | |
| 46-010 | B & N Coal Co. | 5 miles NW of Philippi, W. Va. | Drift | 8 | 3.1 | 973 | 106 | 330.3 | 36 | | |
| | | | | Average of two samples (3) | | | | | | | |

Sub-Basin #8 (Continued)
Lower West Fork
West Virginia

| Inventory Number | Company Name & Mine Name | Location | Type of Mine | Field Inventory Data (1965-67) gpm | pH | Net Acid mg/l | Net Acid lb/day | Iron mg/l | Iron lb/day | Treatment Provided & Remarks (1) (4) Flow gpm | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 49-004 | | 0.9 miles N. of Flemington, W. Va. | Drift | 10 | 2.8 | 1010 | 125 | 156.0 | 19 | | |
| 49-007 | Hill Top Coal Co. | 1.3 miles W.S.W. of Flemington, W. Va. | Drift | ½ | 3.2 | 1270 | 8 | 228.0 | 1 | | |
| 54-001 | Bethlehem Mines Corp.<br>Ida May No. 44 | Idamay, W. Va. | Preparation Plant | 50 | 6.3 | -103 | -62 | 0.8 | 0 | | **Water is treated for pH control & used in preparation plant.** |
| 54-004 | Mountaineer Coal Co.<br>Williams Mine | 1 mile W. of Enterprise, W. Va. | Preparation Plant | 50 | 6.3 | -24 | -20 | 36.2 | 31 | | Flow from refuse disposal area |
| 54-005 | Rochester & Pittsburgh Coal Co.<br>Four States Mine | Four States, W. Va. | Preparation Plant | 26 | 3.7 | 1581 | 485 | 792.0 | 243 | | Plant breakdown when visited: slurry from plant dumped into creek was sampled. |
| 54-024 | Allen Coal Co. | 1.5 miles SW of Shinnston, W. Va. | Drift | 6 | 3.0 | 720 | 56 | 117.6 | 9 | | |
| 54-180 | Mountaineer Coal Co.<br>Owings Mine | Owings, W. Va. | Drift | 597 | 3.2 | 979 | 1519 | 142.4 | 364 | | Should be mined out at present time |
| | | | | Average of six samples (3) | | | | | | | |
| 54-185 | Mountaineer Coal Co.<br>Robinson Run Mine | 2.7 miles N.W. of Lumberport, W. Va. | Drift | 2 | 5.5 | 535 | 10 | 228.0 | 4 | | New mine when visited |
| 54-186 | Mountaineer Coal Co.<br>Williams Mine | N.W. of Enterprise, W. Va. past Wyatt, W. Va. | Shaft | 1 | 7.2 | -122 | -2 | 2.8 | 0 | | |
| | | | | 6 | 3.0 | 1275 | 84 | 450.0 | 30 | | |
| | | | | 102 | 4.6 | 2710 | 3329 | 138.0 | 170 | | **Edgell Pump: aerator & pond: neutralization, aeration & pond for sludge repository.** |
| | | | | 131 | 5.6 | 280 | 442 | 289.2 | 456 | | |
| | | | | 181 | 7.1 | -278 | -606 | 37.2 | 81 | | |
| | | | | | | | | | | | Williams Mine: **Main South pump & & Levi Moore pump @ Enterprise - neutralization, aeration, & settling pond.** |

Sub-Basin #8 (Continued)
Lower West Fork
Wes. Virginia

| Inventory Number | Company Name & Mine Name | Location | Type of Mine | Field Inventory Data (1965-67) | | | | | | Treatment Provided & Remarks (1) (4) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Flow | | Net Acid | | | | Flow | |
| | | | | gpm | pH | mg/l | lb/day | mg/l | lb/day | gpm | |
| 54-193 | Rochester & Pittsburgh O'Donnell No. 1 Mine presently Mountaineer Coal Co. | Four States, W. Va. and W. to Stringtown, W.Va. | Shaft | 50 | 5.8 | 290 | 174 | 240.0 | 144 | | Borehole #2, Stringtown: two ponds, flow regulation |
| | Four States Mine (?) | | | none | | | | | | | Four States Mine #20: neutralization, aeration, & slurry thickness for handling sludge. |
| 54-197 | Bethlehem Mines Corp. Idamay Mine | Idamay, W. Va. | Shaft | 696 | 6.9 | -19 | -159 | 2.4 | 20 | | Borehole #1: flow used in preparation plant; pond |
| 64-038 | D. Goodman | 1.3 miles [illegible].S.E. of Wolf Summit, W. Va. | Drift | 9 | 3.2 | 1010 | 107 | 300 | 32 | | |
| 64-095 | Galloway Land Co. Dawson Mine | S. of Lumberport, W.Va. to Crooked Run | Drift | 921 | 3.4 | 1114 | 14870 | 288.0 | 4484 | | |
| | | | | Average of thirteen samples (3) | | | | | | | |

Sub-Basin #9
Ten Mile Creek
West Virginia

| Inventory Number | Company Name & Mine Name | Location | Type of Mine | Field Inventory Data (1965-67) | | | | | | Treatment Provided and Remarks (1) (4) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Flow | | Net Acid | | Iron | | Flow | |
| | | | | gpm | pH | mg/l | lb/day | mg/l | lb/day | gpm | |
| 14-057 | B. Robey | 1.3 miles E. of Lumberport, W. Va. | Drift | 6 | 2.7 | 1950 | 151 | 564.0 | 44 | | |
| 61-002 | Clinchfield Coal Co. Compass No. 3 Mine | Dola, W. Va.; on Little Ten Mile Creek | Preparation Plant | 9 | 3.3 | 676 | 73 | 137.0 | 15 | | |
| | | | | Average of two samples (3) | | | | | | | |
| 61-003 | Clinchfield Coal Co. Compass No. 3 Mine | Dola, W.Va.; on Little Ten Mile Creek | Drift & Shaft | 83 | 3.1 | 1200 | 1203 | 372.0 | 373 | | No. 3 SA sample Point: Borehole #1; aeration & ponds inadequate - new treatment system being bought (1969). |
| | | | | 1 | 6.6 | -73 | -1 | 9.6 | 0 | | No. 1 Sample Point |
| 61-018 | Ohio Mining Co. Robey Run Coal Co. #3 | 4.5 miles E. of Wallace, W. Va. | Drift | 33 | 4.3 | 710 | 285 | 294.0 | 118 | | |
| 64-119 | A & L Coal Co. Sonet Mine | 2.3 miles N.W. of Robey, W.Va. on Ten Mile Creek | Drift | 3 | 2.9 | 510 | 18 | 169.0 | 6 | | |
| 64-133 | Clinchfield Coal Co. Compass No. 2 Mine | S.E. of Dola, W.Va. on Little Ten Mile Creek | Drift | 67 | 3.8 | 210 | 169 | 330.0 | 265 | | Little Rockcamp Run |
| | | | | 38 | 6.5 | -357 | -161 | 492.0 | 222 | | Tenmile |
| | | | | 26 | 8.0 | -366 | -111 | 4.8 | 15 | | Tenmile |
| | | | | | | | | | | | Borehole [illegible], Olive Portal: settling pond aeration & neutralization. |
| | | | | | | | | | | | Borehole #2, Davisson Farm; ponds, aeration, flow regulation |
| 64-134 | Clinchfield Coal Co. Mars No. 2 Mine | Chiefton to Marshville, 4.5 miles W. of Clarksburg, W. Va. | Drift | 125 | 7.6 | -261 | -393 | 114.0 | 172 | | Borehole #1, neutralization, aeration, & three settling ponds. |

Sub-Basin #10
Elk Creek
West Virginia

|  |  |  |  | Field Inventory Data (1965-66) |  |  |  |  |  | Treatment Provided and Remarks (1) (4) |  |
|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  |  |  | Net Acid |  | Iron |  |  |  |
| Inventory Number | Company Name & Mine Name | Location | Type of Mine | Flow gpm | pH | mg/l | lb/day | mg/l | lb/day | Flow gpm |  |
| 4-126 | Taylor & Sons | 1.7 miles E.N.E. of the juncture of Lewis, Upshur, & Harrison Co's, W. Va. | Drift | 5 | 2.6 | 910 | 91 | 296.0 | 30 |  |  |
| 7-093 | Bittner Mining Co. | 4.3 miles S.W. of the juncture of Barbour, Harrison, & Taylor Co's, W. Va. | Strip & Auger | 206 | 5.3 | 177 | 171 | 21.8 | 33 |  |  |
|  |  |  |  | Average of nine samples (3) |  |  |  |  |  |  |  |
| 7-094 | Cleghorne | 4.5 miles S.W. of the juncture of Barbour, Harrison & Taylor Co's, W. Va. | Strip & Auger | 76 | 3.1 | -32 | -59 | 8.1 | 5 |  |  |
|  |  |  |  | Average of three samples (3) |  |  |  |  |  |  |  |
| 7-106 | Grafton Coal Co. | 4.1 miles S. of the juncture of Barbour, Harrison & Taylor Co's, W. Va. | Drift | 3 | 6.5 | -21 | -1 | 14.5 | 1 |  |  |
| 7-107 | Grafton Coal Co. | 4.1 miles S.S.W. of the juncture of Barbour, Harrison & Taylor Co's, W. Va. | Strip & Auger | 5 | 3.3 | 550 | 32 | 227.4 | 13 |  |  |
|  |  |  |  | Average of two samples (3) |  |  |  |  |  |  |  |
| 7-127 | S & M Coal Co. | 0.8 miles E.N.E. of point where State Route 20 crosses Harrison-Barbour County line. | Drift | 20 | 3.0 | 1370 | 325 | 366.3 | 87 |  |  |
| 7-134 | Bell Mining Co. | 2.3 miles E.S.E. of point where State Route 57 crosses Harrison-Barbour County line. | Strip | 17 | 7.1 | 8 | 2 | 75.4 | 16 |  |  |
|  |  |  |  | Average of two samples (3) |  |  |  |  |  |  |  |
| 7-153 | Griffin Bros. Coal Co. | 1.6 miles W. of Elk City; W. of Philippi, W. Va. | Strip | 2 | 3.7 | 170 | 3 | 766.1 | 14 |  |  |

Sub-Basin #10 (Continued)
Elk Creek
West Virginia

| Inventory Number | Company Name & Mine Name | Location | Type of Mine | Field Inventory Data (1965-66) Flow gpm | pH | Net Acid mg/l | Net Acid lb/day | Iron mg/l | Iron lb/day | Treatment Provided and Remarks (1) (4) Flow gpm |
|---|---|---|---|---|---|---|---|---|---|---|
| 7-155 | T. Casella Mining Co. | 2.6 miles W.N.W. of Elk City: W. of Philippi, W. Va. | Drift | 68 | 3.6 | 155 | 125 | 47.9 | 38 | |
| 7-157 | Leach Coal Co. | 3.1 miles S.S.E. of Brownton, W. Va. | Drift | 12 | 2.4 | 2015 | 304 | 2274.0 | 343 | |
| 7-170 | Elliver Coal Co.<br>Venture No. 1 | 2.0 miles S.S.W. of Brownton, W. Va. | Drift | 58 | 2.4 | 10705 | 7474 | 3758.6 | 2624 | |
| 7-173 | | 4.3 miles S.S.W. of Brownton, W. Va. | Strip & Auger | 189 | 3.7 | 1966 | 1325 | 475.8 | 1219 | |
| | | | | Average of four samples (3) | | | | | | |
| 12-012 | Bethlehem Mines Corp.<br>Century 101 Mine | Century, W. Va. | Drift | 268 | 6.6 | -82 | -299 | 5.5 | 17 | |
| 12-015 | Queen Bros. Coal Co. | 2.0 miles N.W. of Century, W. Va. | Strip | 3 | 5.5 | -52 | -2 | 0.8 | 0 | |
| 12-028 | Dexicar Queen Mine | 1.5 miles N. of Century, W. Va. | Drift | 25 | 5.9 | -10 | -3 | 9.1 | 3 | |
| 12-033 | Kent Coal Co. | 2.0 miles N.N.W. of Century, W. Va. | Drift | 20 | 2.9 | 474 | 114 | 81.0 | 20 | |
| 40-032 | Briar Hill Coal Co. | | Strip | 8 | 5.9 | 149 | 14 | 11.5 | 1 | |
| | | | | Average of two samples (3) | | | | | | |

Sub-Basin #11
Upper West Fork
West Virginia

| Inventory Number | Company Name & Mine Name | Location | Type of Mine | Field Inventory Data (1965-66) | | | | | | Treatment Provided & Remarks (1) (4) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Flow | | Net Acid | | Iron | | Flow |
| | | | | gpm | pH | mg/l | lb/day | mg/l | lb/day | gpm |
| 4-124 | Queen Coal Co. | 3.3 miles S.S.E. of juncture of Harrison, Lewis, & Upshur Co's, W. Va. | Strip & Auger | 30 | 5.5 | -58 | -21 | 14.5 | 5 | |
| 40-078 | S. & W. Coal Co. | 1.4 miles W. of Mount Clare, W. Va. | Drift | 3 | 2.8 | 920 | 33 | 143.0 | 5 | |
| 62-008 | Petitto Bros. | 1.9 miles S.S.E. of West Milford, W. Va. | Drift | 9 | 2.8 | 821 | 85 | 108.8 | 11 | |
| 62-014 | United Coal Co. | 4.5 miles S. of West Milford, W. Va. | Strip | 1 | 4.2 | 475 | 6 | 71.0 | 1 | |
| 62-030 | United Coal Co. | 0.5 miles N.E. of McWorther, W. Va. | Preparation Plant | 23 | 2.1 | 12400 | 3435 | 3850.0 | 1067 | |
| 62-035 | Pinola Mining Co. | 3.8 miles S.W. of West Milford, W.Va. | Strip & Drift | 1 | 6.9 | 263 | 4 | 24.9 | 0 | |
| 63-048 | State Mental Hospital | 1.4 miles W. of Weston, W. Va. | Drift | 35 | 3.3 | 1170 | 493 | 141.0 | 59 | |
| 64-006 | | 1.5 miles S. of Wolf Summit, W. Va. | Drift | 8 | 3.6 | 288 | 29 | 91.0 | 9 | |
| 64-022 | Titanic Coal Co. No. 1 | 3.3 miles E. of Wolf Summit, W. Va. | Drift | 41 | 4.9 | | 488 | | 218 | |

Sub-Basin #12
Lower Tygart
West Virginia

| Inventory Number | Company Name & Mine Name | Location | Type of Mine | Field Inventory Data (1965-67) | | | | | | Treatment Provided and Remarks (1) (4) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Flow | | Net Acid | | Iron | | Flow | |
| | | | | gpm | pH | mg/l | lb/day | mg/l | lb/day | gpm | |
| 25-015 | Permco | 4.0 miles N. of juncture of Monongalia, Taylor, & Preston Counties, W. Va. | Strip | 184 | 3.4 | 944 | 2916 | 144.9 | 480 | | |
| | | | | | Average of seven samples (3) | | | | | | |
| 27-008 | Mason Bros. | 1.4 miles S.W. of Pruntytown, W. Va. | Drift | ½ | 5.5 | 41 | 0 | 40.8 | 0 | | |
| 27-031 | State of W. Va. | 1.7 miles S.W. of Pruntytown, W. Va. | Drift | 3 | 4.2 | 180 | 7 | 86.4 | 3 | | |
| 27-032 | State of W. Va. | 2.0 miles S.W. of Pruntytown, W. Va. | Drift | - | 4.2 | 540 | - | 312.0 | - | | Temporarily shut down when visited: sample from in mine |
| 27-084 | | 2.3 miles S.S.W. of Pruntytown, W. Va. | Strip | 103 | 3.0 | 135 | 167 | 29.1 | 36 | | Domestic mine at end of strip is active. |
| | | | | | Average of three samples (3) | | | | | | |
| 42-076 | M. Jennings | 2.7 miles S.S.E. of Reedsville, W. Va. | Drift | 1 | 2.7 | 830 | 10 | 190.0 | 2 | | |
| 42-079 | Sapp Coal Co. Mine No. 1 | 4.9 miles N.E. of Newberg, W. Va. | Drift | 8 | 2.2 | 926 | 89 | 265.4 | 26 | | |
| | | | | | Average of three samples (3) | | | | | | |
| 42-087 | | 3.7 miles S.S.E. of Reedsville, W. Va. | Drift | 4 | 2.9 | 1350 | 57 | 366.0 | 15 | | |
| 42-110 | Sanders Coal Co. | 2.3 miles W.S.W. of Tunnelton, W. Va. | Drift | 5 | 2.7 | 1310 | 4 | 360.0 | 1 | | |
| 42-114 | H. Morris | 2.5 miles N.W. of Tunnelton, W. Va. | Drift | 16 | 2.4 | 1250 | 239 | 408.0 | 78 | | |
| 42-115 | H. Morris | 2.5 miles N.W. of Tunnelton, W. Va. | Drift | 28 | 2.6 | 2140 | 708 | 541.2 | 179 | | |
| | | | | | Average of three samples (3) | | | | | | |

Sub-Basin #12
Lower Tygart
West Virginia

| Inventory Number | Company Name & Mine Name | Location | Type of Mine | Field Inventory Data (1965-67) | | | | | | Treatment Provided and Remarks (1) (4) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Flow | | Net Acid | | Iron | | Flow | |
| | | | | gpm | pH | mg/l | lb/day | mg/l | lb/day | gpm | |
| 42-123 | R. McCabe | 3.1 miles N.N.W. of Tunnelton, W. Va. | Drift | 75 | 3.3 | 50 | 45 | 8.1 | 7 | | |
| 42-166 | | 1.8 miles N.N.E. of Newberg, W. Va. | Drift | 2 | 2.1 | 1600 | 39 | 366.0 | 9 | | |
| 42-168 | Peasly Trucking Co. | 5.0 miles N.N.E. of Newberg, W. Va. | Tipple | 13 | 3.0 | 1490 | 230 | 349.2 | 54 | | Water runs over coal piles. |
| 42-174 | Luella Jean Coal Co. | W. End of tunnel @ Tunnelton, W. Va. | Drift | 214 | 2.6 | 1590 | 4107 | 312.0 | 606 | | |
| 42-175 | Hauch Reidler Bros. Coal Co. | 2.0 miles of Tunnelton, W. Va. | Strip & Drift | 1145 | 3.1 | 353 | 7391 | 282.7 | 783 | | |
| | | | | | Average of thirty-four samples (3) | | | | | | |
| 42-180 | | 3.2 miles N.N.W. of Tunnelton, W. Va. | Strip & Drift | 32 | 2.8 | 510 | 194 | 65.0 | 25 | | |
| 42-186 | Double R Coal Co. | 3.5 miles W.N.W. of Tunnelton, W. Va. | Drift | ½ | 5.9 | -49 | -0 | 5.7 | 0 | | |
| 42-190 | Kemp Coal Co. | 2.1 miles N.W. of Tunnelton, W. Va. | Strip & Drift | 134 | 3.1 | 315 | 203 | 13.9 | 2 | | |
| | | | | | Average of five samples (3) | | | | | | |

Sub-Basin #13
Middle Tygart
West Virginia

| Inventory Number | Company Name & Mine Name | Location | Type of Mine | Field Inventory Data (1965-66) Flow gpm | pH | Net Acid mg/l | Net Acid lb/day | Iron mg/l | Iron lb/day | Treatment Provided and Remarks (1) (4) Flow gpm | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1-047 | Grafton Coal Co. | 2.0 miles N. of Tygart Junction, W. Va. | Strip | 3 | 3.3 | 360 | 15 | 106.0 | 4 | | |
| 3-020 | Thorn Bros Coal Co. | 3.4 miles N.N.E. of Belington, W. Va. | Strip | 4 | 3.8 | 305 | 11 | 25.6 | 1 | | |
| 3-039 | C & W Coal Co. | 3.0 miles S.W. of Nestorville, W. Va. | Drift | 5 | 3.0 | 574 | 40 | 176.0 | 11 | | |
| 3-197 | C Shafer | 2.2 miles E. of Nestorville, W. Va. | Strip | 2 | 5.7 | 3 | 0 | 0.7 | 0 | | |
| 46-001 | Badger Coal Co. | 1.2 miles NE of Philippi, W. Va. | Preparation Plant | 121 | 3.6 | 690 | 1003 | 185.0 | 269 | | |
| 46-085 | Ketchem Coal Co. | 1.2 miles E. of Philippi, W. Va. | Drift | ½ | 3.5 | 140 | 1 | 16.1 | 0 | | |
| 46-090 | Badger Coal Co.<br>No. 14 Mine | 1.3 miles N.E. of Philippi, W. Va. | Drift | 126<br>Average of two samples (3) | 3.6 | 190 | 288 | 15.0 | 23 | | Neutralization, aeration, two settling ponds, & two sludge repositories. |

Sub-Basin #14
Buckhannon River
West Virginia

| Inventory Number | Company Name & Mine Name | Location | Type of Mine | Field Inventory Data (1965-66) Flow gpm | pH | Net Acid mg/l | Net Acid lb/day | Iron mg/l | Iron lb/day | Treatment Provided and Remarks (1) (4) Flow gpm |
|---|---|---|---|---|---|---|---|---|---|---|
| 4-015 | Miller | 5.5 miles E. of Berlin, W. Va. | Drift | 15 | 5.6 | -78 | -14 | 1.2 | 0 | |
| 4-022 | Warner Coal Co. | 5.3 miles E.S.E. of Berlin, W. Va. | Drift | 15 | 3.1 | 1700 | 307 | 206.0 | 37 | |
| 4-026 | A.D. Martin & Son Coal Co. | 5.6 miles E.S.E. of Berlin, W. Va. | Drift | 1 | 6.7 | -126 | -1 | 4.9 | 0 | |
| 12-052 | Bennett Coal Co. | 2.7 miles N.N.W. of Buckhannon, W.Va. | Drift | 4 | 3.6 | 727 | 35 | 212.0 | 10 | |
| 12-056 | Talbutt | 2.2 miles N.N.W. of Buckhannon, W. Va. | Drift | 3 | 2.8 | 883 | 32 | 117.0 | 4 | |
| 12-077 | Dexicar Queen Mining Co.<br>Smith No. 8 | 3.3 miles N. of Buckhannon, W.Va. | Drift | 1 | 4.3 | 10 | 1 | 6.6 | 0 | |
| 12-135 | Karaichoff<br>old Hackers Creek Mine | 0.5 miles S. of Hodgesville, W. Va. | Drift | 1 | 4.1 | 20 | 0 | 21.2 | 0 | |
| 12-178 | Seeley | 2.3 miles N.N.W. of Buckhannon, W. Va. | Drift | ½ | 3.2 | 398 | 2 | 105.0 | 1 | |
| 16-009 | Upshur Co. Coal Co. Ltd. | 0.9 miles N.W. of Adrian, W. Va. | Drift | 1400 | 6.5 | -91 | -1514 | 22.4 | 373 | |
| 47-023 | Elkhorn Coal Co. | 6.2 miles N.E. of Pickens, W. Va. | Strip & Drift | 66 | 5.0 | 7 | 6 | 3.6 | 3 | |
| | | | | Average of two samples (3) | | | | | | |
| 51-143 | | 3.5 miles E.S.E. of Buckhannon, W.Va. | Strip | 10 | 3.5 | 61 | 7 | 0.9 | 0 | |
| 51-151 | | 5.8 miles E. of Buckhannon, W. Va. | Drift | 1 | 3.3 | 74 | 1 | 4.7 | 0 | |
| 51-183 | R. Shipman | 6.4 miles S.E. of Buckhannon, W. Va. | Drift | 2 | 6.1 | 3 | 0 | 2.1 | 0 | |

Sub-Basin #15
Middle Fork River
West Virginia

| Inventory Number | Company Name & Mine Name | Location | Type of Mine | Field Inventory Data (1965) | | | | | | Treatment Provided and Remarks (1) (4) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Flow | | Net Acid | | Iron | | Flow |
| | | | | gpm | pH | mg/1 | lb/day | mg/1 | lb/day | gpm |
| 20-029 | Huttonsville Prison Mine | 2.6 miles W.N.W. of Valley Bend, W. Va. | Drift | 8 | 3.3 | 60 | 6 | 10.8 | 1 | |
| 51-033 | T. Altieri | 2.8 miles W.N.W. of Cassity, W. Va. | Drift | 15 | 6.3 | -11 | -2 | 0.9 | 0 | |
| 51-041 | Three Forks Coal Co. No. 7 Mine | 3.0 miles S.W. of Cassity, W. Va. | Drift | 10 | 8.1 | -135 | -16 | 3.7 | 0 | |
| 51-044 | Three Forks Coal Co. No. 6 Mine | 2.7 miles W.S.W. of Cassity, W. Va. | Drift | 1 | 4.5 | 6 | 0 | 0.3 | 0 | |
| 51-226 | H. Barnhart | 9.0 miles S.E. of Buckhannon, W. Va. | Drift | 8 | 5.0 | 4 | 0 | 0.5 | 0 | |

Sub-Basin #16
Upper Tygart Valley River
West Virginia

| Inventory Number | Company Name & Mine Name | Location | Type of Mine | Field Inventory Data (1965) | | | | | | Treatment Provided and Remarks (1) (4) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Flow gpm | pH | Net Acid mg/1 | Net Acid lb/day | Iron mg/1 | Iron lb/day | Flow gpm | |
| 20-006 | J. Lipsbcomb | 0.6 miles N.N.E. of Junior, W. Va. | Drift | 2 | 3.8 | 154 | 5 | 6.1 | 0 | | |
| 20-063 | Demont | 0.8 miles S.W. of Harding, W. Va. | Strip,<br>Drift,<br>Auger | 12 | 3.3 | 43 | 6 | 4.6 | 1 | | |
| 51-008 | W. Wilkinson | 0.7 miles N.W. of Harding, W. Va. | Strip | 4 | 4.9 | 7 | 0 | 0.9 | 0 | | |
| 51-243 | | 2.5 miles SW of Coalton, W. Va. | Strip | 3 | 2.2 | | 391 | | 93 | | |
| | Roaring Creek Coal Co. | Roaring Creek area, W. Va. | 2 Drifts | 370 | | | 2560 | | 570 | | Data from Norton Project of F.W.P.C.A. |

Sub-Basin #18
Lower Cheat River
West Virginia

| Inventory Number | Company Name & Mine Name | Location | Type of Mine | Field Inventory Data (1966-68) Flow gpm | pH | Net Acid mg/l | Net Acid lb/day | Iron mg/l | Iron lb/day | Treatment Provided and Remarks (1) (2) Flow gpm | (4) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 17-024 | Kingwood Mining Co. Job No. 4 | 2.7 miles S.W. of Cuzzart, W. Va. | Strip | 84 | 3.6 | 687 | 814 | 116.7 | 136 | | |
| 17-068 | Coal Lick Coal Co. Mine No. 1 | 4.9 miles S.W. of Cuzzart, W. Va. | Drift | 3 | 2.8 | 1140 | 38 | 426.0 | 14 | | |
| 32-078 | | 1.7 miles W.N.W. of Kingwood, W. Va. | Drift | 1 | 2.2 | 8600 | 102 | 912.0 | 11 | | |
| 32-154 | | 2.5 miles W.N.W. of Kingwood, W. Va. | Drift | ½ | 3.6 | 110 | 1 | 12.0 | 0 | | |
| 32-165 | | 1.5 miles N.N.W. of Kingwood, W. Va. | Drift | ½ | 2.9 | 384 | 2 | 53.0 | 0 | | |
| 33-005 | A. Moreland | 0.8 miles S.E. of Lake Lynn, W. Va. | Drift | 6 | 2.4 | 3355 | 263 | 130.5 | 102 | | |
| | | | | Average of two samples (3) | | | | | | | |
| 33-013 | Lenard Coal Co. | 1.0 mile S.S.W. of Lake Lynn, W. Va. | Drift | 50 | 2.3 | 4900 | 2950 | 124.8 | 751 | | |
| 33-015 | Cheat View Coal Co.-drift<br>Bortz Coal Co. - strip | 0.5 miles S.S.W. of Lake Lynn, W. Va. | Strip & Drift | 152 | 2.3 | 5318 | 8608 | 130.6 | 881 | | Only drift was active |
| | | | | Average of five samples (3) | | | | | | | |
| 33-016 | C & A Coal Co.-drift<br>Bortz Coal Co.-strip | 1.3 miles S. of Lake Lynn, W. Va. | Strip & Drift | 2 | 2.3 | 2915 | 71 | 600.0 | 15 | | |
| 33-022 | Palo Coal Co. | 1.5 miles S.W. of Lake Lynn, W. Va. | Drift | ½ | 2.6 | 3770 | 22 | 118.2 | 1 | | |
| 36-074 | Daugherty Coal Co. | 2.9 miles ESE of Masontown, W. Va. | Strip | 96 | 2.3 | 2861 | 4407 | 565.4 | 1424 | | |
| | | | | Average of six samples (3) | | | | | | | |

Sub-Basin #18 (Continued)
Lower Cheat River
West Virginia

| Inventory Number | Company Name & Mine Name | Location | Type of Mine | Field Inventory Data (1966-68) | | | | | | Treatment Provided and Remarks (1) (2) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Flow | | Net Acid | | Iron | | Flow | (4) |
| | | | | gpm | pH | mg/l | lb/day | mg/l | lb/day | gpm | |
| 36-092 | Cascade Coal Co. | 2.1 miles NE. of Masontown, W. Va. | Drift | 39 | 2.5 | 1963 | 1128 | 497.6 | 326 | | |
| | | | | Average of three samples (3) | | | | | | | |
| 36-096 | M. Jennings | 2.8 miles NE. of Masontown, W. Va. | Strip | 15 | 4.3 | 40 | 7 | 0.4 | 0 | | |
| 36-097 | | 2.7 miles NE. of Masontown, W. Va. | Drift | 4 | 3.5 | 170 | 7 | 33.6 | 1 | | |
| 36-100 | | 3.3 miles NE. of Masontown, W. Va. | Drift | 47 | 4.7 | 236 | 106 | 42.4 | 19 | | |
| | | | | Average of three samples (3) | | | | | | | |
| 36-113 | Mountain Run Coal Co. No. 3 Mine | 1.7 miles NE. of Masontown, W. Va. | Drift | 2 | 3.0 | 480 | 10 | 127.2 | 3 | | |
| 36-121 | | 3.0 miles NE. of Masontown, W. Va. | Strip & Drift | 12 | 2.8 | 1845 | 255 | 438.0 | 61 | | |
| 36-132 | Preston County Coal Co. | 2.1 miles N.N.E. of Masontown, W. Va. | Strip & Drift | 90 | 2.8 | 917 | 994 | 165.6 | 178 | | |
| | | | | Average of two samples (3) | | | | | | | |
| 38-267 | E. Lyons | 1.8 miles N of Canyon, W. Va. | Drift | 1 | 2.7 | 1251 | 162 | 444.0 | 58 | | |
| 38-318 | R. Chess | 2.8 miles N.N.E. of Canyon, W. Va. | Drift | 3 | 3.1 | 1061 | 424 | 366.0 | 146 | | |
| 59-030 | K.C.D. Coal Co. old Tri State Mine | 1.6 miles S. of Valley Point, W. Va. | Drift | 28 | 3.0 | 1515 | 248 | 422.4 | 7 | | |
| | | | | Average of two samples (3) | | | | | | | |
| 59-082 | Zip Coal Co. | 0.4 miles S. of Valley Point, W. Va. | Drift | 6 | 2.9 | 420 | 28 | 82.3 | 5 | | |
| 59-115 | Reliable Coal Co. | 3.0 miles W. of Ruthbelle, W. Va. | Drift | 75 | 6.6 | -28 | -25 | 13.6 | 12 | | |
| Pennsylvania | | | | | | | | | | | |
| 20-413 | R. J. Smith Coal Co. | 2.5 miles S. of Smithfield, Pa. | Strip & Drift | 250 | 2.5 | 2290 | 6888 | 372.0 | 1119 | | |

Sub-Basin #19
Big Sandy Creek
West Virginia

| Inventory Number | Company Name & Mine Name | Location | Type of Mine | Field Inventory Data (1967) |  |  |  |  |  | Treatment Provided & Remarks (1) (4) |
|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  | Flow | pH | Net Acid |  | Iron |  | Flow |
|  |  |  |  | gpm |  | mg/l | lb/day | mg/l | lb/day | gpm |
| 8-011 | D. & F. Coal & Fuel | 5.0 miles W.S.W. of Bruceton Mills, W. Va. | Drift | 8 | 3.0 | 740 | 67 | 151.2 | 14 |  |

Sub-Basin #20
Upper Cheat River
West Virginia

| Inventory Number | Company Name & Mine Name | Location | Type of Mine | Field Inventory Data (1966-67) Flow gpm | pH | Net Acid mg/l | Net Acid lb/day | Iron mg/l | Iron lb/day | Treatment Provided & Remarks (1) (4) Flow gpm |
|---|---|---|---|---|---|---|---|---|---|---|
| 32-001 | Chapel Coal Co. | 2.2 miles S.W. of Kingwood, W. Va. | Preparation Plant | 2 | - | - | 2537 | - | 692 | |
| | | | | Load calculated from stream samples | | | | | | |
| 32-007 | Mark Coal Co. | 0.9 miles E.S.E. of Tunnelton, W. Va. | Drift | 3 | 2.7 | 1712 | 56 | 31.0 | 1 | |
| 32-010 | Haskiell | 1.4 miles E.S.E. of Tunnelton, W. Va. | Drift | ½ | 2.4 | 2270 | 13 | 324.4 | 2 | |
| 32-011 | Haskiell | 1.3 miles E.S.E. of Tunnelton, W. Va. | Drift | ½ | 1.9 | 10860 | 65 | 3852.0 | 23 | |
| 32-015 | F. Ray | 1.4 miles N.E. of Tunnelton, W. Va. | Strip | 7 | 3.2 | 1585 | 130 | 385.2 | 32 | |
| 32-020 | R.R. Coal Co. | 2.0 miles N.E. of Tunnelton, W. Va. | Strip | 3 | 2.9 | 414 | 14 | 23.8 | 1 | |
| 32-023 | Hartman Coal Co. | 2.7 miles N.E. of Tunnelton, W. Va. | Drift | 4 | 6.3 | -502 | -25 | 11.0 | 1 | |
| 32-029 | Hartman Coal Co. | 3.2 miles E.N.E. of Tunnelton, W. Va. | Drift | ½ | 4.9 | 82 | 0 | 10.9 | 0 | |
| 32-036 | Erwin | 3.5 miles N.E. of Tunnelton, W. Va. | Drift | 21 | 3.1 | 308 | 79 | 4.0 | 1 | |
| 32-047 | Chappel Coal Co. | 3.1 miles N.E. of Tunnelton, W. Va. | Drift | 230 | 2.7 | 1405 | 5764 | 295.9 | 769 | |
| | | | | Average of four samples (3) | | | | | | |
| 32-058 | Borghman | 3.3 miles S.W. of Kingwood, W. Va. | Drift | 19 | 2.3 | 1910 | 193 | 492.0 | 50 | |
| | | | | Average of two samples (3) | | | | | | |
| 32-064 | A. Matheny | 1.6 miles W.S.W. of Kingwood, W. Va. | Drift | 7 | 2.3 | 3004 | 221 | 866.4 | 64 | |

Sub-Basin #20 (Continued)
Upper Cheat River
West Virginia

| Inventory Number | Company Name & Mine Name | Location | Type of Mine | Field Inventory Data (1966-67) Flow gpm | pH | Net Acid mg/1 | Net Acid lb/day | Iron mg/1 | Iron lb/day | Treatment Provided & Remarks (1) (4) Flow gpm |
|---|---|---|---|---|---|---|---|---|---|---|
| 32-092 | C. Alexander | 3.0 miles S.W. of Kingwood, W. Va. | Strip | ½ | 2.3 | 5216 | 31 | 36.0 | 0 | |
| 32-109 | | 1.9 miles W.S.W. of Kingwood, W. Va. | Drift | ½ | 2.6 | 2210 | 13 | 696.0 | 4 | |
| 32-141 | Radabaugh | 2.2 miles N.N.E. of Tunnelton, W. Va. | Drift | 2 | 2.1 | 5102 | 124 | 144.0 | 35 | |
| 32-179 | Sandy Creek Coal Co. | 0.4 miles S. of Albright, W. Va. | Preparation Plant | 5 | 2.4 | 2800 | 175 | 288.0 | 18 | |
| 32-183 | R. Ervin | 2.9 miles N.E. of Tunnelton, W. Va. | Drift | 1 | 5.5 | -16 | 0 | 38.2 | 0 | |
| 32-185 | Lick Run Coal Co. | 2.3 miles N.N.E. of Tunnelton, W.Va. | Drift | 4 | 2,4 | 1506 | 74 | 298.0 | 15 | |
| | | | | | Average of two samples (3) | | | | | |
| 32-188 | Burnwell Coal Co. | 2.1 miles N.N.E. of Tunnelton, W. Va. | Drift | 6 | 2.4 | 2618 | 182 | 552.0 | 38 | |
| 32-194 | Thorn Coal Co. | 3.7 miles S.W. of Kingwood, W. Va. | Drift | 1 | 2.2 | 5410 | 64 | 1914.0 | 23 | |
| 32-213 | Mark Coal Co. | N.E. border of Tunnelton, W. Va. | Preparation Plant | 2 | 3.1 | 900 · | 12 | 192.0 | 4 | |
| | | | | | Average of two samples (3) | | | | | |
| 50-002 | | 2.9 miles N.W. of Rowlesburg, W. Va. | Strip | 2 | 2.9 | 186 | 5 | 96.0 | 2 | |

Sub-Basin #21
Shavers Fork
West Virginia

| Inventory Number | Company Name & Mine Name | Location | Type of Mine | Field Inventory Data (1965-66) Flow gpm | pH | Net Acid mg/l | Net Acid lb/day | Iron mg/l | Iron lb/day | Treatment Provided & Remarks (1) (4) Flow gpm | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 30-011 | Pond Lick Coal Co. | 1.4 miles S.W. of Bowden, W. Va. | Drift | 6 | 3.5 | 52 | 4 | - | - | | |
| 30-012 | H. Hannah | 1.7 miles N.N.E. of Bemis, W. Va. | Drift | 35 | 4.3 | 10 | 4 | 0.2 | 0 | | |
| | Mower Lumber Co. | Cheat Bridge area | Strip | - | - | - | - | - | - | | Opened since field inventory |

Sub-Basin #22
Blackwater River Area
West Virginia

| Inventory Number | Company Name & Mine Name | Location | Type of Mine | Field Inventory Data (1965) Flow gpm | pH | Net Acid mg/l | Net Acid lb/day | Iron mg/l | Iron lb/day | Treatment Provided and Remarks (1) (4) Flow gpm |
|---|---|---|---|---|---|---|---|---|---|---|
| 18-044 | Douglas Coal Co. | 10.0 miles N.E. of Davis, W. Va. | Strip | 20 | 4.8 | 13 | 3 | 2.4 | 1 | |
| 18-51 | Douglas Coal Co. | 2.8 miles N.E. of Davis, W. Va. | Strip | 130 | 4.0 | 514 | 277 | 88.1 | 53 | |
| | | | | | Average of three samples (3) | | | | | |

Sub-Basin #23
Lower Youghiogheny
Pennsylvania

| Inventory Number | Company Name & Mine Name | Location | Type of Mine | Field Inventory Data (1965 & 67-68) |  |  |  |  |  | Treatment Provided & Remarks (1) (2) (5) |  |
|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  |  |  | Net Acid |  | Iron |  |  |  |
|  |  |  |  | gpm | pH | mg/l | lb/day | mg/l | lb/day | Flow gpm |  |
| 3-022 | Endite Construction Co. | Monroeville Mall, Monroeville, Pa. | Strip | 100 | 3.4 | 480 | 579 | 3.2 | 9 |  | Drift mines at site of Mall drain to storm sewer now. |
| 9-178 |  | 0.6 miles E. of Smithton, Pa. | Strip | ½ | 3.9 | 70 | 0 | 0.2 | 0 |  | Not definately active. |
| 11-032 | Republic Steel Banning No. 4 Mine | Area 3.5 miles E. of Donora, Pa. | Shaft | 1970 | 4.1 | 730 | 26246 | 223.8 | 7613 |  |  |
|  |  |  |  |  | Average of four samples (3) |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  | 2000 | Lime neutralization, aeration |
|  |  |  |  |  |  |  |  |  |  | 2000 | Euclid Borehole: lime neutralization, aeration, settling |
| 22-024 | C & Y Coal Co. | 5.4 miles S.E. of McKeesport, Pa. | Drift | 2 | 4.4 | 230 | 7 | 4.8 | 0 |  |  |
| 22-039 | Krevokuch Coal Co. | 0.2 miles S.E. of Scott Haven, Pa. | Strip & Drift | 1 | 6.8 | -229 | -3 | 0.3 | 0 | 100 | No treatment needed |
| 32-027 | C. Hall | Export, Pa. | Strip & Drift | 45 | 4.8 | 424 | 441 | 12.2 | 13 |  |  |
|  |  |  |  |  | Average of two samples (3) |  |  |  |  |  |  |

Sub-Basin #24
Sewickley Creek
Pennsylvania

| Inventory Number | Company Name & Mine Name | Location | Type of Mine | Field Inventory Data (1965) | | | | | | Treatment Provided & Remarks (1) (2) (5) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Flow | | Net Acid | | Iron | | Flow | |
| | | | | gpm | pH | mg/l | lb/day | mg/l | lb/day | gpm | |
| 9-001 | Consolidation Coal Co.<br>Hutchison Mine | Hutchison, Pa. | Shaft | 4890 | 5.2 | 539 | 41,159 | 191.5 | 15,739 | | |
| | | | | | Average of two sample points (3) | | | | | 882 | Incomplete data transfer |
| 9-049 | P. Lutz | 1.3 miles N of Yukon, Pa. | Drift | 2 | 2.8 | 981 | 24 | 46.4 | 1 | | |
| 9-077 | Delmont Fuel Co.<br>No. 10B Mine | 3.8 miles S.E. of Yukon, Pa. | Drift | 184 | 3.1 | 658 | 1457 | 144.0 | 319 | 486 | |
| 11-003 | S & V Coal Co. | 1.4 miles E. of Suterville, Pa. | Drift | 36 | 4.0 | 411 | 151 | 1.3 | 1 | | |
| | | | | | Average of two samples (3) | | | | | | |
| 18-002 | Laurie Mining Co. | 1.9 miles N.E. of Arona, Pa. | Drift | 6 | 7.6 | -51 | -4 | 1.1 | 0 | | |
| | | | | | Average of two samples (3) | | | | | | |

Sub-Basin #25
Middle Youghiogheny River
Pennsylvania

| Inventory Number | Company Name & Mine Name | Location | Type of Mine | Field Inventory Data (1965) | | | | | | Treatment Provided & Remarks (1) (2) (5) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Flow | | Net Acid | | Iron | | Flow |
| | | | | gpm | pH | mg/l | lb/day | mg/l | lb/day | gpm |
| 9-218 | | 1.0 miles N.E. of Perryopolis, Pa. | Strip | 2 | 2.9 | 1380 | 34 | 169.2 | 4 | |

Sub-Basin #26
Mountz and Indian Creeks
Pennsylvania

| Inventory Number | Company Name & Mine Name | Location | Type of Mine | Field Inventory Data (1966) Flow gpm | pH | Net Acid mg/l | Net Acid lb/day | Iron mg/l | Iron lb/day | Treatment Provided & Remarks (1) (2) Flow gpm | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 8-087 | | 2.4 miles NE of Indian Creek Reservoir, Pa. | Drift | 2 | - | 2492 | 61 | 696.0 | 17 | | |
| 10-031 | J. Burdick | 0.7 miles N. of Buchanan, Pa. | Drift | 3 | - | 0 | 0 | 13.2 | 0 | | |
| 10-059 | Eastern Associated Coal Company Melcroft Mine | Melcroft, Pa. | Drift | unknown | | | | | | | Flow mixed with drainage from inactive mines underground and drains to flume which by-passes the Indian Creek reservoir |
| 10-080 | Nickles | 0.3 miles S. of Buchanan, Pa. | Strip | ½ | 4.0<br>Litmus paper pH | 218 | 1 | 21.5 | 0 | | |
| 10-093 | Marston Coal Co. | 0.9 miles S.E. of Clinton, Pa. | Drift | 3 | 2.0<br>Litmus paper pH | 2380 | 86 | 744.0 | 27 | | |
| 10-094 | Marston Coal Co. | 0.8 miles S.E. of Clinton, Pa. | Drift | 1 | 3.0<br>Litmus paper pH | 410 | 5 | 25.3 | 0 | | |
| 10-108 | | 1.3 miles S.W. of Clinton, Pa. | Drift | ½ | 3.0<br>Litmus paper pH | 461 | 3 | 65.8 | 0 | | |

Sub-Basin #27
Youghiogheny River West
Pennsylvania

| Inventory Number | Company Name & Mine Name | Location | Type of Mine | Field Inventory Data (1966-67) Flow gpm | pH | Net Acid mg/l | Net Acid lb/day | Iron mg/l | Iron lb/day | Treatment Provided and Remarks (1) (2) Flow gpm | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 8-074 | Kaiser Aluminum | 2.0 miles S. of Ohiopyle, Pa. | Strip | 15 | - | 75 | 14 | 20.4 | 4 | | Clay mine. coal being discarded. |
| 8-075 | Harbison-Walker | 1.7 miles S. of Ohiopyle, Pa. | Strip | 20 | - | 339 | 92 | 117.6 | 7 | | Clay mine. coal being discarded. |
| | | | | | | Average of two samples (3) | | | | | |
| 34-090 | W. Green | 1.7 miles S. of Dunbar, Pa. | Strip | 4 | 3.8 | 110 | 5 | 1.0 | 0 | | |

Sub-Basin #29
Casselman River

| Inventory Number | Company Name & Mine Name | Location | Type of Mine | Field Inventory Data (1965-66) |  |  |  |  |  | Treatment Provided & Remarks (1) (2) |
|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  | Flow | pH | Net Acid |  | Iron |  | Flow |
|  |  |  |  | gpm |  | mg/1 | lb/day | mg/1 | lb/day | gpm |
| Pennsylvania |  |  |  |  |  |  |  |  |  |  |
| 2-001 | Pine Hill | Good Town, Pa. | Preparation Plant | 3 | 5.1 | 588 | 21 | 106.0 | 4 |  |
| 2-034 | Pine Hill Smokeless Coal Company | Good Town, Pa. | Strip | 30 | 3.5 | 170 | 61 | 36.5 | 13 |  |
| 2-035 | Pine Hill Coal Co. | Good Town, Pa. | Drift | 26 | 2.8 | 570 | 175 | 52.8 | 16 |  |
|  |  |  |  |  | Average of two samples (3) |  |  |  |  |  |
| 2-066 | Scrufield Coal Co. | Berlin, Pa. | Preparation Plant | 4 | 3.2 | 90 | 4 | 5.9 | 0 |  |
| 8-004 | Thomas Mine | 3.9 miles S.E. of Confluence, Pa. | Drift | 84 | 3.0 | 254 | 251 | 50.2 | 50 |  |
|  |  |  |  |  | Average of four samples (3) |  |  |  |  |  |
| 24-007 | Boynton Coal Co. | 1.1 miles E. of Boynton, Pa. | Drift | 74 | 2.9 | 529 | 471 | 92.7 | 83 |  |
| 24-006 | Bowers & Holler | 1.5 miles E.N.E. of Boynton, Pa. | Drift | 24 | 3.8 | 22 | 6 | 0.0 | 0 |  |
| 24-056 |  | 1.2 miles S.S.E. of Casselman, Pa. | Strip | 131 | 5.2 | 36 | 57 | 11.4 | 18 |  |
| 24-074 | Decker | 2.6 miles N.E. of Garrett, Pa. | Strip | 71 | 3.3 | 310 | 267 | 3.6 | 3 |  |
| 24-087 | Merrill | 1.5 miles N.N.E. of Garrett, Pa. | Strip | 23 | 3.9 | 440 | 123 | 2.3 | 1 |  |
| 24-106 | Saps | 1.8 miles N.N.W. of Rockwood, Pa. | Strip | 43 | 4.0 | 160 | 83 | 62.4 | 32 |  |
| 24-129 | Schaffer | 4.8 miles S.E. of Casselman, Pa. | Drift | ½ | 3.0 | 940 | 6 | 27.7 | 0 |  |

Sub-Basin #29
Casselman River

| Inventory Number | Company Name & Mine Name | Location | Type of Mine | Field Inventory Data (1965-66) Flow gpm | pH | Net Acid mg/l | Net Acid lb/day | Iron mg/l | Iron lb/day | Treatment Provided & Remarks (1) (2) Flow gpm | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Pennsylvania** | | | | | | | | | | | |
| 24-179 | Robertson | 0.9 miles N.N.W. of Boynton, Pa. | Drift | ½ | - | 170 | 1 | 16.8 | 0 | | |
| 24-208 | Vogle | 3.2 miles E. of Rockwood, Pa. | Drift | 54 | 2.8 | 480 | 312 | 59.0 | 38 | | |
| 24-235 | Merrill | 2.0 miles E. of Garrett, Pa. | Strip | 59 | 2.9 | 1125 | 1014 | 290.4 | 287 | | |
| | | | | | Average of three samples (3) | | | | | | |
| 37-003 | Kamber No. 20 | 3.4 miles S.S.E. of Friedens, Pa. | Drift | 11 | 3.7 | 130 | 17 | 34.6 | 5 | | |
| **Maryland** | | | | | | | | | | | |
| 2-014 | Beachy & Beachy | Niverton, Pa. | Strip | 164 | 2.8 | 1151 | 2918 | 69.4 | 230 | | No treatment |
| | | | | | Average of two samples (3) | | | | | | |
| 3-003 | A. Mazzarelli | 1.1 miles S. of High Point on U.S. 40 in Maryland | Strip | 20 | 3.8 | 60 | 14 | 112.0 | 27 | | No treatment |

Sub-Basin #30
Upper Youghiogheny River
Maryland

| Inventory Number | Company Name & Mine Name | Location | Type of Mine | Field Inventory Data (1965-66) Flow gpm | pH | Net Acid mg/l | Net Acid lb/day | Iron mg/l | Iron lb/day | Treatment Provided & Remarks Flow gpm | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 5-007 | | S.E. corner of Friendsville, Md. | Drift | 2 | 3.2 | 416 | 13 | 15.7 | 0 | | No treatment provided |
| 13-001 | H. Reems | 0.9 miles S.W. of Deep Creek Lake Dam, Md. | Drift | 1 | 3.0 | 179 | 2 | 9.7 | 0 | | No treatment provided |
| 13-002 | R. & R. Coal Co. | 0.7 miles S.W. of Deep Creek Lake Dam, Md. | Drift | 1 | 2.9 | 750 | 9 | 132.0 | 2 | | No treatment provided |

Footnotes

(1) Mine water treatment data obtained from Pennsylvania Department of Health and West Virginia Department of Water Resources during 1969.

(2) It is assumed that all treated active mine discharges in Pennsylvania meet legal requirements.

These requirements are:

a. mine discharge must contain net alkalinity
b. mine discharge must have pH of 7.0 or above
c. mine discharge must have total iron concentration of 7 mg/l or less.

(3) Average values for pH and concentrations only.

(4) For intrastate streams in West Virginia, the following state regulations apply:

Drainage or discharges containing acid mine water shall be treated where necessary so that the receiving stream shall not

1. contain more than 30.0 milligrams per liter (parts per million) of aluminum;

2. contain more than 10.0 milligrams per liter (parts per million) of total iron;

3. have a pH of less than 5.5;

4. contain more than 200 milligrams per liter (parts per million) of total suspended solids;

5. have an unsightly appearance.

(Article 6, Chaper 20-5, section 5.03 Code of West Virginia)

These regulations, however, have not been accepted by the Secretary of the Interior,as interstate water quality standards.

(5) Mines which were dry at time of inventory and usually dry according to permit information have not been included in this table.

CLEAN WATER

ENFORCEMENT CONFERENCE

MONONGAHELA RIVER & ITS TRIBUTARIES

# MINE DRAINAGE REPORT
# TO
# CONFEREES

ENVIRONMENTAL PROTECTION AGENCY

1971

318<

Prepared by

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The Monongahela River, shown in Figure 1, is formed by the confluence of the West Fork and Tygart Valley rivers at Fairmont, West Virginia. The drainage area of the basin is 7,384 square miles with 2,736 square miles in Pennsylvania, 4,228 square miles in northeastern West Virginia and 420 square miles in western Maryland. The river flows in a northerly direction and joins the Allegheny to form the Ohio River at Pittsburgh, Pennsylvania. Major tributary rivers are the Youghiogheny, Cheat, West Fork and Tygart Valley. The Monongahela Basin is mountainous and has rugged topography with narrow stream valleys several hundred feet below the level of the uplands. The river flows through the Appalachian Plateau region.

In the early 1960's, the United States Secretary of Health, Education, and Welfare became increasingly aware that a serious interstate pollution problem was occurring in the Monongahela River Basin. On the basis of reports, surveys, and studies, the Secretary called a conference on August 7, 1963, concerning pollution of the Monongahela River and its tributaries. Discharges of untreated and inadequately treated sewage and industrial waste, including coal

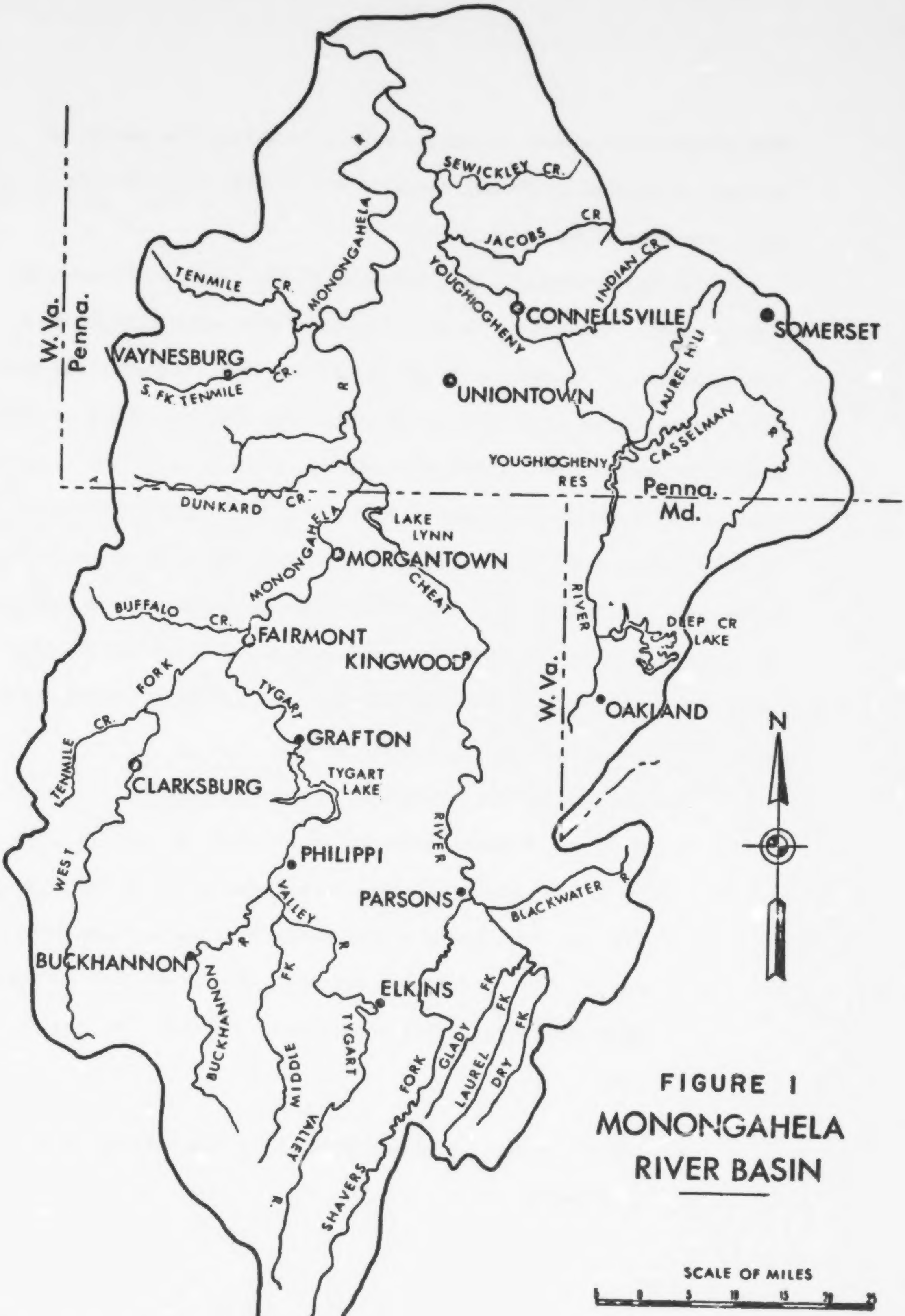

FIGURE 1
MONONGAHELA
RIVER BASIN

mine discharges in West Virginia, were endangering the health and welfare of persons in Pennsylvania, a state other than that in which the discharges originated.

The conference was held December 17-18, 1963, at Pittsburgh, Pennsylvania. Conferees representing the state water pollution control agencies of Pennsylvania, Maryland, and West Virginia, the Ohio River Valley Water Sanitation Commission, and the Department of Health, Education, and Welfare (DHEW) attended the conference. (The responsibilities of the DHEW were transferred from the U. S. Public Health Service to the Federal Water Pollution Control Administration (FWPCA) in January 1966. The FWPCA was transferred from DHEW to the Department of the Interior in May 1966, subsequently renamed the Federal Water Quality Administration (FWQA), and transferred to the Environmental Protection Agency in December 1970.)

The Chairman of the conference pointed out that:

1. Under the Federal Water Pollution Control Act (33 U. S. C. 466 et seq.) pollution of interstate waters which endangers the health or welfare of persons in a state other than the one in which the discharges originate is subject to abatement under procedures described in Section 8 of the Federal Act.

2. The first step of this procedure is the calling of a conference.

3. The purpose of the conference was to bring the states, the interstate agency, and the Department of Health, Education, and Welfare and other interested parties together to review the existing situation and the progress made, to lay a basis for future action by all parties concerned, and to give the states, localities, and industries an opportunity to take any remedial action which may be indicated under state and local law.

The conferees unanimously agreed on the following conclusions and recommendations:

"1. Pollution of an interstate nature exists in the Monongahela River Basin which adversely affects municipal and industrial water supplies, fish and wildlife, and recreation, such as fishing, boating, swimming, and navigation.

2. The States of West Virginia, Pennsylvania, Maryland, and the Chio River Valley Water Sanitation Commission have made appreciable progress in water pollution abatement and have presented acceptable programs for the control of industrial and municipal wastes.

3. Cognizance is taken of Pennsylvania's program to abate pollution from such sources by the end of 1966.

Commensurate programs have been developed by West Virginia and Maryland. It is recognized that court action may necessarily modify this program and that economically depressed communities in the basin may have to depend on outside financial assistance.

4. The establishment of a technical committee consisting of representatives of West Virginia, Pennsylvania, Maryland, the Ohio River Valley Water Sanitation Commission, and the Federal Government to explore the means of abating pollution caused by coal mine drainage is recommended. This committee would be charged with determining the amount of pollution from such mines. The committee also would be charged with developing a remedial program, including a cost estimate."

In accordance with recommendation No. 4, the technical committee was established with the recommended representatives.

The technical committee of the Monongahela River Enforcement Conference held its objective to be:

> "To determine the sources, types, and amounts of pollution from coal mines in the Monongahela River Basin, means and cost estimates for abating such pollution."

To carry out this objective the committee established the Monongahela River Mine Drainage Remedial Project. The committee detailed a scope of work for the Monongahela Project to accomplish these objectives. This work included the search of existing state records of mines located during the joint federal-state program of 1935-39. Field maps and aerial photos for the study were procured and methods to describe and sample sources were developed.

The actual work of locating, sampling and describing the sources of mine drainage began in January 1965 and continued through May 1968. This was accompanied by the location of and sampling at stream stations throughout the basin to provide information on the effects of mine drainage on the stream water quality.

The large amount of data and variety of information to be acquired necessitated the use of automatic data processing methods.

Further programs, other than those for the initial data retrieval, were developed to assist in analyzing the data as well as to improve capabilities of storing, up-dating and retrieving data. For purposes of inventory and reporting of results, the total area of the Monongahela Basin was sub-divided into thirty smaller drainage areas. Detailed data, including site location, description, and discharge data were developed for each sub-basin.

During the inventory, which continued from January 1965 through May 1968, a total of 7,002 sites associated with coal mining were located and described. The relative distribution of the types of sites that were inventoried is shown in Table 1.

Inactive sites constituted 92 percent of the total. Inactive drift mines constitute nearly one-half of the sites and inactive strip mines account for about one-third of the sites.

Of the 7,002 mine and mine-associated sites, 3,046 were draining at the time of the inventory. Table 2 contains data on the draining sites. The total net acid load from all coal mining sites in the Monongahela River Basin was 1,079,575 lb/day, and the total iron load was 302,896 lb/day. This data does not reflect the additional pollution of other chemicals or sediment which are found in mine drainage.

The data of Tables 1 and 2 are combined and presented as percentages of total in Table 3. The following items are of particular significance in Table 3:

1. The most potent source of mine drainage pollution was active mines. Active sites comprised only 8 percent of all sites and 10 percent of the draining sites, but even with the treatment plants existing at the time of inventory, the active sites contributed 35 percent of the total net acid load and 40 percent of the total iron load in the basin.
2. Underground mines are the source of most acid mine drainage. Underground sites, both active and inactive,

### Table 1

## SUMMARY OF TOTAL SITES INVENTORIED IN THE MONONGAHELA RIVER BASIN

| Site Type | Inactive Sites | & of Total | Active Sites | % of Total | Total Sites | % of Total |
|---|---|---|---|---|---|---|
| Preparation Plant | 42 | 0.6 | 54 | 0.8 | 96 | 1.4 |
| Strip Mines | 2,322 | 33.2 | 149 | 2.1 | 2,471 | 35.3 |
| Strip & Auger Mines | 65 | 0.9 | 14 | 0.2 | 79 | 1.1 |
| Drift Mines | 3,373 | 48.2 | 278 | 4.0 | 3,651 | 52.1 |
| Strip & Drift Mines | 450 | 6.4 | 32 | 0.5 | 482 | 6.9 |
| Shaft or Slope Mines | 170 | 2.4 | 33 | 0.5 | 203 | 2.9 |
| Refuse Piles | 17 | 0.2 | 1 | - | 18 | 0.3 |
| Shaft & Strip Mines | 1 | - | 0 | - | 1 | - |
| Coal Storage Areas | 1 | - | 0 | - | 1 | - |
|  | 6,441 | 91.9 | 561 | 8.1 | 7,002 | 100.0 |

### Table 2

## SUMMARY OF DRAINING SITES IN THE MONONGAHELA RIVER BASIN

| SITE TYPE | NO. OF SITES | TOTAL NET ACIDITY (lbs/day) | TOTAL IRON (lbs/day) |
|---|---|---|---|
| Preparation Plants (active) | 33 | 9,541 | 2,912 |
| Preparation Plants (inactive) | 5 | 1,044 | 113 |
| Shaft or Slope Mines (active) | 21 | 73,645 | 43,023 |
| Shaft or Slope Mines (inactive) | 24 | 33,910 | 27,622 |
| Strip Mines (active) | 53 | 14,428 | 3,911 |
| Strip Mines (inactive) | 738 | 92,012 | 15,043 |
| Drift Mines (active) | 164 | 224,076 | 62,367 |
| Drift Mines (inactive) | 1,655 | 436,049 | 114,384 |
| Strip & Drift Comb. Mines (active) | 26 | 56,549 | 7,973 |
| Strip & Drift Comb. Mines (inactive) | 263 | 120,565 | 20,807 |
| Strip & Auger Mines (active) | 8 | 1,444 | 1,275 |

Table 2 (Cont.)

## SUMMARY OF DRAINING SITES IN THE MONONGAHELA RIVER BASIN

| SITE TYPE | NO. OF SITES | TOTAL NET ACIDITY (lbs/day) | TOTAL IRON (lbs/day) |
|---|---|---|---|
| Strip & Auger Mines (inactive) | 47 | 13,402 | 2,453 |
| Refuse Areas (active) | 1 | 0 | 0 |
| Refuse Areas (inactive) | 7 | 2,910 | 1,013 |
| Shaft & Strip Mines (inactive) | 1 | 0 | 0 |
| TOTALS | 3,046 | 1,079,575 lbs/day | 302,896 lbs/day |
| Dry Sites | 3,956 | | |
| TOTAL | 7,002 | | |

Table 3

PERCENTILE PRESENTATION OF DATA IN TABLE 1 AND 2

| | Underground Mines[1] | Surface Mines[2] | Combination Surface and Underground[3] | Other Sites[4] | Total Percentages |
|---|---|---|---|---|---|
| Percent of Total Sites (Table 1) | | | | | |
| Active Sites | 4 | 2 | 1 | 1 | 8 |
| Inactive Sites | 51 | 34 | 6 | 1 | 92 |
| Total | 55 | 36 | 7 | 2 | 100 |
| Percent of Draining Sites (Table 2) Total Sites | | | | | |
| Active Sites | 6 | 2 | 1 | 1 | 10 |
| Inactive Sites | 55 | 26 | 9 | 0 | 90 |
| Total | 61 | 28 | 10 | 1 | 100 |
| Percent of Net Acidity | | | | | |
| Active Sites | 27.6 | 1.4 | 5.2 | 0.9 | 35.1 |
| Inactive Sites | 43.5 | 9.8 | 11.2 | 0.4 | 64.9 |
| Total | 71.1 | 11.2 | 16.4 | 1.3 | 100.0 |
| Percent of Total Iron | | | | | |
| Active Sites | 34.8 | 1.7 | 2.6 | 0.9 | 40.0 |
| Inactive Sites | 46.9 | 5.8 | 6.9 | 0.4 | 60.0 |
| Total | 81.7 | 7.5 | 9.5 | 1.3 | 100.0 |

1. Includes drift and shaft mines.

2. Includes strip and auger mines.

3. Includes strip and drift combination mines.

4. Includes refuse piles, preparation plants, a coal storage area, and a strip and shaft mine.

comprised 55 percent of all sites, 61 percent of the draining sites, and contributed 71 percent of the net acid load and 82 percent of the iron load.

3. Inactive underground sites contributed 43 percent of the net acid load and 47 percent of the iron load and thus are the largest contributors to stream degradation.

If it is assumed that the drainage from combination underground-surface sites originates primarily in underground mines, then underground mines were responsible for nearly 88 percent of the net acid and 91 percent of the iron entering Monongahela River basin streams. By this assumption, the contribution of inactive underground mines was about 55 percent of the net acid and 54 percent of the iron.

Another approach to locating the problem is to tabulate the relative distribution of pollution sources within the Monongahela River basin. A portion of this tabulation is shown in Table 4. More complete tabulations were too voluminous to fit readily into a table. The following comments are noted as a result of these tabulations:

1. The pollutional contribution from all types of active mines was greatest in the Middle and Upper Monongahela River, Lower West Fork River, Lower Tygart River, Lower Cheat River, Lower Youghiogheny River, and Sewickley

Table 4

## MONONGAHELA RIVER BASIN
## SUMMARY OF INVENTORY DATA

| SUB-BASIN No. | Name | AREA (sq.mi.) | STREAM LENGTH Total (mi.) | STREAM LENGTH Affected (mi.) | NUMBER DRAINING SITES | SITE LOADS lbs/day Net Acid | SITE LOADS lbs/day Iron | ESTIMATED COST |
|---|---|---|---|---|---|---|---|---|
| 1 | Lower Monongahela R. | 316 | 474 | 173 | 232 | 12,400 | 9,069 | $ 974,500 1/ |
| 2 | Redstone & Dunlap C. | 151 | 226 | 99 | 20 | 21,203 | 18,352 | 2,310,500 2/ |
| 3 | Tenmile C., Pa. | 338 | 507 | 81 | 53 | - 838 | 2,094 | 104,000 |
| 4 | Middle Monongahela R. | 264 | 396 | 199 | 125 | 50,434 | 16,428 | 1,620,250 |
| 5 | Dunkard C. | 234 | 351 | 28 | 30 | 10,994 | 4,506 | 742,000 |
| 6 | Upper Monongahela R. | 293 | 440 | 180 | 195 | 233,453 | 64,844 | 2,576,500 |
| 7 | Buffalo & Paw Paw C. | 173 | 260 | 42 | 13 | 12 | 934 | None |
| 8 | Lower West Fork R. | 250 | 375 | 171 | 402 | 201,195 | 48,029 | 12,368,350 |
| 9 | Tenmile C., W. Va. | 125 | 188 | 37 | 64 | 8,945 | 4,185 | 970,500 |
| 10 | Elk C. | 121 | 182 | 96 | 109 | 36,086 | 12,586 | 1,976,000 |
| 11 | Upper West Fork R. | 386 | 579 | 146 | 224 | 8,539 | 2,115 | 3,910,000 |
| 12 | Lower Tygart R. | 191 | 287 | 123 | 185 | 65,902 | 13,477 | 4,451,500 |
| 13 | Middle Tygart R. | 313 | 470 | 140 | 146 | 8,061 | 1,195 | 1,879,500 |
| 14 | Buckhannon R. | 309 | 464 | 64 | 268 | 3,229 | 1,191 | 4,718,650 |

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1/ Sum of $44,000 for at-source mine drainage control and $930,500 initial cost for construction of treatment plants. An annual operating cost of $271,700 is estimated for the treatment plants.

2/ Sum of $1,100,000 for at-source mine drainage control and $1,210,500 initial cost for construction of treatment plants. An annual operating cost of $353,500 is estimated for the treatment plants.

(Continued on next page)

Table 4 (Cont.)

MONONGAHELA RIVER BASIN
SUMMARY OF INVENTORY DATA

| SUB-BASIN No. | Name | AREA (sq.mi.) | STREAM LENGTH Total (mi.) | Affected (mi.) | NUMBER DRAINING SITES | SITE LOADS lbs/day Net Acid | Iron | ESTIMATED COST |
|---|---|---|---|---|---|---|---|---|
| 15 | Middle Fork R. | 151 | 227 | 19 | 67 | 1,192 | 113 | 975,000 |
| 16 | Upper Tygart R. | 347 | 521 | 22 | 41 | 7,195 | 353 | 1,416,000 |
| 17 | Leading C. | 60 | 90 | - | - | - | - | None |
| 18 | Lower Cheat R. | 170 | 255 | 144 | 145 | 140,031 | 26,907 | 3,071,500 |
| 19 | Big Sandy C. | 208 | 312 | 68 | 42 | 1,496 | 160 | 858,100 |
| 20 | Upper Cheat R. | 330 | 495 | 30 | 100 | 19,958 | 5,166 | 1,447,500 |
| 21 | Shavers Fork | 215 | 323 | 42 | 32 | 763 | 73 | 486,250 |
| 22 | Blackwater R. Area | 499 | 749 | 44 | 53 | 11,816 | 1,282 | 925,000 |
| 23 | Lower Youghiogheny R. | 259 | 389 | 106 | 106 | 76,019 | 21,175 | 2,388,000 |
| 24 | Sewickley C. | 168 | 252 | 41 | 58 | 90,144 | 37,496 | 6,261,500 |
| 25 | Middle Youghiogheny R. | 149 | 224 | 68 | 29 | 3,185 | 622 | 1,074,000 |
| 26 | Mounts & Indian C. | 157 | 236 | 28 | 58 | 10,076 | 1,639 | 499,000 |
| 27 | Youghiogheny R. West | 183 | 275 | 30 | 17 | 783 | 162 | 263,000 |
| 28 | Laurel Hill C. | 125 | 188 | 4 | 12 | 30 | 3 | 185,000 |
| 29 | Casselman R. | 465 | 698 | 125 | 183 | 55,576 | 8,512 | 3,589,000 |
| 30 | Upper Youghiogheny R. | 434 | 651 | 60 | 37 | 1,692 | 228 | 198,500 |
|  | TOTALS | 7,384 | 11,084 | 2,410 | 3,046 | 1,079,575 | 302,896 | 62,239,600 |

Creek sub-basins. Discharges from active underground mines were the primary source of stream degradation only in the Upper Monongahela River sub-basin.

2. Water quality in watersheds in the central portion of the Monongahela River basin was degraded by pollutants from both active and inactive mine sources, and water quality in the headwaters areas was degraded principally by pollutants from inactive mine sources.
3. It was generally true that approximately 20 percent of sources in an area contribute 85 percent of the net acid pollution. This becomes apparent upon detailed study of the individual sub-basins. The average amount of net acid contributed per source varied greatly among the sub-basins.

Yet another approach exists to identify problem areas in the basin. Estimates are made of the total lengths of the streams in the basin that were affected by mine drainage. Results of the study reveal that 2,410 miles of streams were affected by mine drainage. An affected stream was considered one that contained mineralization from mine drainage in concentrations noticeably in excess of background levels. Mileage figures are presented in the form of sub-basin totals in Table 5. The mileage determinations are based on field observations, analytical data, and knowledge of mine drainage source locations. In the right-hand column of Table 5

## Table 5

## MILES OF STREAMS IN THE MONONGAHELA RIVER SUB-BASINS AFFECTED BY MINE DRAINAGE

| Sub-Basin No. | Sub-Basin | Total Miles of Streams* | Miles Affected | Ratio miles affected/ Total miles |
|---|---|---|---|---|
| 1 | Lower Monongahela River | 474 | 173 | .36 |
| 2 | Redstone & Dunlap Creeks | 226 | 99 | .44 |
| 3 | Tenmile Creek, Pa. | 507 | 81 | .16 |
| 4 | Middle Monongahela River | 396 | 199 | .50 |
| 5 | Dunkard Creek | 351 | 28 | .08 |
| 6 | Upper Monongahela River | 440 | 180 | .41 |
| 7 | Buffalo & Paw Paw Creeks | 260 | 42 | .16 |
| 8 | Lower West Fork River | 375 | 171 | .46 |
| 9 | Tenmile Creek, W. Va. | 188 | 37 | .20 |
| 10 | Elk Creek | 182 | 96 | .53 |
| 11 | Upper West Fork River | 579 | 146 | .25 |
| 12 | Lower Tygart Valley River | 287 | 123 | .43 |
| 13 | Middle Tygart Valley River | 470 | 140 | .30 |
| 14 | Buckhannon River | 464 | 64 | .14 |
| 15 | Middle Fork River | 227 | 19 | .08 |
| 16 | Upper Tygart Valley River | 521 | 22 | .04 |
| 17 | Leading Creek | 90 | ** | ** |
| 18 | Lower Cheat River | 255 | 144 | .56 |
| 19 | Big Sandy Creek | 312 | 68 | .22 |
| 20 | Upper Cheat River | 495 | 30 | .06 |
| 21 | Shavers Fork | 323 | 42 | .13 |
| 22 | Blackwater River Area | 749 | 44 | .06 |
| 23 | Lower Youghiogheny River | 389 | 106 | .27 |
| 24 | Sewickley Creek | 252 | 41 | .16 |
| 25 | Middle Youghiogheny River | 224 | 68 | .30 |
| 26 | Mounts and Indian Creeks | 236 | 28 | .12 |
| 27 | Youghiogheny River West | 275 | 30 | .11 |
| 28 | Laurel Hill Creek | 188 | 4 | .02 |
| 29 | Casselman River | 698 | 125 | .18 |
| 30 | Upper Youghiogheny River | 651 | 60 | .09 |
| | Totals | 11,084 | 2,410 | .22 |

*Estimated values obtained by multiplying the drainage area by 1.5 miles of streams per square mile.

**No mining in the basin.

are listed the ratio of the stream miles affected by mine drainage in each sub-basin, to the estimated total miles of streams. In this way, a relative factor is assigned for each defined study area to provide a basis of comparison of the pollution problem.

As indicated by the ratios, the Lower Cheat River, Elk Creek, Middle Monongahela River, Lower West Fork River, Lower Tygart River, Redstone and Dunlap creeks, and the Upper Monongahela River sub-basins had more than 40 percent of the streams affected by mine drainage. The Laurel Hill Creek and Upper Tygart Valley River areas were affected only slightly.

This inventory documented the belief that the Monongahela River is more intensely polluted by mine drainage than any other major river in the United States. Degraded conditions were widespread in most of the principal tributary watersheds. Only minor areas of the basin that contain no mined coal beds were free from the pollutional effects of mine drainage.

Specific mine drainage stream pollution problems noted within the Monongahela River basin are: high concentrations of minerals and chemicals as acidity, iron, manganese, sulfate, and hardness; low pH; and turbidity and bottom deposits of chemical precipitates. In addition, siltation caused by runoff from mining activities often caused severe local stream pollution problems.

Mine drainage affects water uses in various ways. To many, the most dramatic effects of mine drainage pollution are in the destruction of fish and other aquatic life and impairment to stream appearance. Mine drainage pollution affects the use of water for municipal and industrial water supply by increasing the costs for equipment and water treatment. Additional damaging effects of mine drainage are the increase in corrosiveness to boats, dams, and other structures that are in contact with the water.

Generally, alkaline surface water within the basin occurs in small tributaries located in the northwestern and southern extremities of the study area. With this general exception, surface waters of the basin are acidic or marginally acidic as a result of coal mine drainage. Waters of the Monongahela Basin not affected by acid mine drainage are generally only slightly alkaline "or buffered" with limited acid neutralization capacity. Small amounts of acid drainage seriously affect these streams.

It is startling to realize that less than an 18 percent depletion of the original bituminous coal resource has resulted in the vast mine drainage pollution problem that now exists in the Monongahela River Basin.

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Since the site inventory was started, Pennsylvania has developed an effective program for the control of drainage from active coal mining operations. Contour or terrace backfilling of strip mines has been required since 1963. A remaining area of technical difficulty in Pennsylvania is the control of drainage following the abandonment of underground mines that were opened prior to 1965, since these mines were not subject to the same preplanning constraints that went into effect during that year. Regulation of mine drainage pollution is also hampered because the mining of other minerals is not subject to the same regulations as are mining operations for coal until the operation develops a polluting discharge. At that time the mining operation becomes subject to the same regulations as the coal mining operation.

West Virginia had the earliest surface mining law of any state (1946) and has a generally effective program for the reclamation of land disturbed by active and inactive or "orphaned" surface mines. The legal authority to control pollution from active deep mines has existed for some time, but progress has been hindered because of the lack of personnel and funds. As of July 1, 1969, the Division of Water Resources, Department of Natural Resources, was given the authority to control the opening, re-opening, operating, and abandonment of all deep mines, quarries, or preparation plants, but the implementation of this authority will be dependent on financial constraints related to regulatory agency needs.

These data fulfill the difficult charge to the Committee and the Project "to determine the sources, types, and amounts of pollution from coal mines in the Monongahela River basin . . ." The second charge, " . . . to determine cost estimates for abating such pollution... " was also a difficult task.

Abating pollution from inactive mines is a task the cost and success of which are difficult to accurately predict at this time. The difficulty derives from the fact that there is little experience with watershed-scale abatement projects upon which to base estimates.

Order-of-magnitude cost estimates have been prepared to indicate the potential amount that might be necessary to implement a comprehensive program for abating pollution from inactive mines. An estimate of feasible and economical remedial work in each sub-basin was prepared. These estimations of at-source abatement were totaled for the entire Monongahela River Basin as shown in Table 6. A unit cost was estimated and applied to each type of measure suggested. The total estimated costs in Table 6 were obtained in this manner. In two sub-basins, No. 1 and 2, a total of six lime

## Table 6

## ESTIMATED ABATEMENT COSTS

| ABATEMENT TECHNIQUE | ESTIMATED NUMBER OF UNITS REQUIRED | UNIT COST | TOTAL COST |
|---|---|---|---|
| Surface Mine Reclamation | 8,954 acres | $500/acre | 4,477,000 |
| Subsidence Reclamation | 1,682 acres | $2000/acre | 3,364,000 |
| Refuse Pile Reclamation | 1,786 acres | $2000/acre | 3,572,000 |
| Seals to Underground Mine Openings | 3,241 seals | $15,000/each | 48,615,000 |
| Diversion Ditch | 26,400 ft. | $1.50 ft. | 39,600 |
| Reforestation of Strips | 155 acres | $200/acre | 31,000 |
| Treatment Plants | 6 plants<br>17 tons/day net acid | $125,000/ton/day construction | 2,141,000* |
| | | Total Construction Costs = | $62,239,600 |

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* An annual operating cost of $625,200, based upon $100/ton/day, is estimated for the 6 plants. The plants are suggested for sub-basins 1 and 2 only.

neutralization treatment plants placed near mine drainage sources are recommended. An initial construction cost of $2,141,000 and an annual operating cost of $625,000 are projected. To this must be added the costs of engineering design, acquisition of land and mineral rights, the costs of maintaining the constructed facilities, and other miscellaneous costs. There is no way to estimate such costs as acquisition of land and mineral rights at this time. In a comprehensive program, such costs could be great, since areas might be involved that include substantial minable coal reserves. The total of these "at source" costs is approximately $60,000,000.

A major defect in the cost estimate is considered to be the cost for underground mine sealing. This estimate is considered defective because the strip mines in areas of early underground mining created more openings to underground mines than originally existed and left many of these openings covered. Preliminary surveys of the present type are not adequate in such situations. If the assumption were made that all areas would be as complex as ones that have been examined in detail in the Upper West Fork River area and in the Upper Tygart River area, the cost of mine sealing alone could be more than ten times the amount shown in Table 6 or more than $486 million.

To summarize: The initial estimated cost of a comprehensive program for at-source control of acid mine drainage from inactive sites in the Monongahela basin would exceed 60 million and might be greater than 498 million dollars. Calculations of the data from the Monongahela River basin inventory have shown that many problems exist in arriving at definite pollutional load values. This also has been true in arriving at methods to be used for the control of mine drainage. The total aspect of mine drainage treatment or control is a vastly complicated problem. Definite procedures to be used for loading evaluation, treatment or control methods, and the resultant cost analyses for the partial or complete solution to the problem are not possible, based on the type of information requested and obtained. Experience has indicated that because of mining methods and mine conditions the actual number of openings is often as much as ten times the number visible.

To be completely effective, the program would probably need to be supplemented by treatment. If at-source control of drainage from inactive sources were only 50 percent effective, then treatment plants would be needed. Present data indicate that the initial investment in treatment plants to neutralize net acidity from all inactive sources, exclusive of sub-basins 1 and 2, would be in the order of $21,000,000, and plant annual operating costs would be about $6,132,000. The total estimated cost for the additional water treatment over a 20-year period would be about $144,000,000. The cost of the collection systems to transport mine water to the treatment plants may be from one to 20 times more than the cost of the plants. Total estimated costs for at-source abatement and water treatment range from $218 million to $656 million for a 20-year period.

It should be reemphasized that these costs are only presented to indicate the order of magnitude of funds required. Meaningful estimates can only be obtained by working with small representative areas on a trial abatement basis to obtain data that are reliable and representative.

## RECOMMENDATIONS

The technical committee of the Monongahela River Enforcement Conference has agreed to and submits to the conferees the following recommendations:

1. A Remedial Project committee for the Monongahela River Basin be established to direct and coordinate the abatement programs recommended by the conferees. The committee shall be comprised of representatives of West Virginia, Pennsylvania, Maryland, ORSANCO, and the Federal Government.

2. In the event that funds are made available for application to the abatement of mine drainage in the Monongahela Basin, that appropriate state, interstate, and federal agency delegations of authority be given to respective state, interstate, and federal officials who are members of the Remedial Project committee to enable said officials to commit the allocated funds.

3. The Remedial Project committee be chaired by the federal representative and be charged with, but not limited to, the following responsibilities:
   (a) to develop methods to assign priorities to areas or sub-basins that are to receive abatement measures.

These methods shall be based on sound technical principles consistent with attainment of the established water quality standards;

(b) to establish priorities for areas or sub-basins in accordance with the methods developed;

(c) to have prepared more finite estimates on the cost of selected projects;

(d) to review and evaluate state programs in the basin for abatement of present and future pollution from active mining operations;

(e) to evaluate progress and accomplishments of abatement projects;

(f) to determine financial assistance required by the states to carry out selected abatement projects;

(g) to prepare progress reports for submission to the conferees and the Secretary of the Interior by July 1 of each year.

4. The FWPCA provide the technical staff to assist the Remedial Project committee in accomplishing the assigned responsibilities.

5. A legal study be financed by the FWPCA covering an analysis of legal problems in abatement and control of water pollution from mining and associated functions. Model legislation be developed based on:

(a) a study of patterns of ownership of mineral rights in the Basin.

(b) a study of possible state legislation aimed at determining methods to:

1. obtain right of entry for reclamation work.
2. assure public benefit from reclamation work.

6. The state governments will adopt and enforce a program to: abate present and future pollution from active mining operations; establish and define who will be responsible for preventing pollution from mines that are presently active and will be inactivated in the future, as well as the establishment of this responsibility for all future mines prior to their development; and develop a program for maintenance and operation of abatement facilities and measures.

7. That the sum of $5,000,000 be made available to be used for the purpose of initiating engineering studies to determine specific project costs, and to fund agreed to projects. As finite engineering estimates are completed, funds would then be requested in accordance with state plans and priorities as established by the Remedial Project committee.
These initial projects would indicate the degree of effectiveness and feasibility of basin-wide mine drainage control.

In addition, these projects would provide a means for the Remedial Project committee to refine the rough estimates prepared from the existing inventory.

Recommendations were submitted by each member of the technical committee.

# GLOSSARY OF TERMS

| | |
|---|---|
| **at-source control** | The application of engineering measures within the immediate environment of a location of mine water formation or discharge to reduce or eliminate the mine drainage pollution capability of that location; exclusive of treatment plants. |
| **mine seal** | A structure placed in an underground mine opening to reduce or eliminate discharge waters or the pollutional effect of such discharges. Seals may be water-tight and/or air-tight, and may be placed in man-made or naturally-formed openings. |
| **site** | Any area located and numbered during the field inventory. It is always associated with coal mining or processing and may or may not drain from one or more points. |
| **source** | A coal mining or related location that produced a measurable discharge at the time of the Monongahela River basin inventory. A source may have one or more discharge points. |

**ENVIRONMENTAL PROTECTION AGENCY**

May 1, 1971

To: Chairman, Monongahela Enforcement Conference

From: Henry P. Stetina, Director
Div. of Interstate Compacts and Uniform State Laws
Office of Enforcement, EPA

Subject: Legal Problems of Coal Mine Reclamation
and Drainage Abatement in Appalachia

This is a description of an investigation currently being undertaken at the University of Maryland School of Law into the legal aspects of environmental problems of coal mining in Appalachia. Scheduled for completion in September 1971, the project is directed by Professors Garrett Power and Everett Goldberg, under a grant from the Federal Water Quality Administration (Henry Stetina, Project Officer). The study concentrates on the laws and problems of four states: Pennsylvania, Maryland, Ohio, and West Virginia. The problems and solutions discussed have a more general application, however.

Although coal mining produces a variety of ecological hazards, the major difficulties with which the project is concerned are acid drainage and the scars, erosion and sedimentation associated with strip mining. Acid drainage results from both deep and surface mining.

These environmental difficulties are associated with both active and abandoned mines. Under existing law states have the power to impose on active miners the duty of abating acid drainage and of performing reclamation work while mining is in progress. Pennsylvania, Maryland, Ohio, and West Virginia all have developed regulations along these lines. The study will explore the efficacy of these regulations. One important question to be considered is the extent to which it is constitutionally permissible to prohibit strip mining or deep mining when circumstances suggest that reclamation or acid abatement will be physically impossible or unlikely.

The more difficult problems have to do with abandoned mines. First is the problem of identifying who can be made financially responsible, and who ought to be made financially responsible. for abatement or reclamation work. The complicated system of mineral ownership and the uncertain nature of land titles in many mining areas complicate this problem. Even if all work is to be done by the government, identifying the surface owner may be important to obtain the necessary easements and rights of access. If the government decides to do the work itself, constitutional problems also are raised. On the one hand, some state constitutions prohibit spending public funds for the direct benefit of private landowners. Although these provisions were adopted to meet abuses of the past, they arguably preclude reclamation activities which raise the value of privately owned land. On the other hand, the government's activity may cut off valuable property rights; for example, where mines with remaining coal reserves are sealed. The conflict between the police power and constitutional requirements of just compensation is nowhere more apparent. Although condemnation is a tool always available to the government, its cost suggests that it will not often be used. Moreover, the possibility of financing condemnation activities by the resale of the condemned land to private individuals after reclamation raises the constitutional question of whether such land is being taken for private rather than public purposes.

It is not the purpose of the study to recommend particular abatement methods, except insofar as their legality or propriety from a non-technological standpoint may be called into question. The project has proceeded on the assumption that regulatory activity will come chiefly at the state level, although the role of interstate and federal agencies is also being taken into account.

In addition to standard methods of legal research, the directors have consulted enforcement officials in the states involved and related interstate and federal agencies. Although few specific conclusions have been reached, it is expected that the study will result in a model statute which may be adapted by states to their particular needs.

A. D. Sidio

The Monongahela River, shown in Figure 1 in this document (See "Mine Drainage Report to Conferees"), and also shown here on the map in front of the drapes there, is formed by the confluence of the West Fork and Tygart Valley Rivers at Fairmont, West Virginia. The drainage area of the basin is 7,384 square miles with 2,736 square miles in Pennsylvania, 4,228 square miles in northeastern West Virginia, and 420 square miles in western Maryland. The river flows in a northerly direction and joins the Allegheny to form the Ohio River at Pittsburgh, Pennsylvania.

I guess from here you can't see where that confluence is but it isn't too far away.

The major tributary rivers are the Youghiogheny, Cheat, West Fork and Tygart Valley. The Monongahela Basin is mountainous and has rugged topography with narrow stream valleys several hundred feet below the level of the uplands. The river flows through the Appalachian Plateau region.

In the early 1960's, the United States Secretary of Health, Education, and Welfare became increasingly aware that a serious interstate pollution problem was occurring in the Monongahela River Basin. On the basis of reports, surveys, and studies, the Secretary called a conference on August 7, 1963, concerning pollution of the Monongahela River and its tributaries. Discharges of untreated and inadequately treated sewage and industrial waste, including coal mine discharges in West Virginia, were endangering the health and welfare of persons in Pennsylvania, a State other than that in which the discharges originated.

The conference was held December 17-18, 1963, at Pittsburgh, Pennsylvania. Conferees representing the State water pollution control agencies of Pennsylvania, Maryland, and West Virginia, the Ohio River Valley Water Sanitation Commission, and the Department of Health, Education and Welfare attended the conference. Since that time, the responsibilities of the DHEW -- that is the water pollution responsibilities -- were transferred from the U. S. Public Health Service to the Federal Water Pollution Control Administration in January of 1966. The FWPCA was transferred from DHEW to the Department of the Interior in May 1966, subsequently renamed the Federal Water Quality Administration, and transferred to the Environmental Protection Agency in December 1970.

The Chairman of the conference pointed out that:

1. Under the Federal Water Pollution Control Act (33 U. S. C. 466 et seq.) pollution of interstate waters which endangers the health or welfare of persons in a State other than the one in which the discharges originate is subject to abatement under procedures described in section

8 of the Federal Act.

2. The first step of this procedure is the calling of a conference.

3. The purpose of the conference was to bring the States, the interstate agency, and the Department of Health, Education, and Welfare, and other interested parties together to review the existing situation and the progress made, to lay a basis for future action by all parties concerned, and to give the States, localities, and industries an opportunity to take any remedial action which may be indicated under State and local law.

The conferees unanimously agreed on the following conclusions and recommendations:

"1. Pollution of an interstate nature exists in the Monongahela River Basin which adversely affects municipal and industrial water supplies, fish and wildlife, and recreation, such as fishing, boating, swimming, and navigation.

"2. The States of West Virginia, Pennsylvania, Maryland, and the Ohio River Valley Water Sanitation Commission have made appreciable progress in water pollution abatement and have presented acceptable programs for the control of industrial and municipal wastes.

"3. Cognizance is taken of Pennsylvania's program to abate pollution from such sources by the end of 1966.

Commensurate programs have been developed by West Virginia and Maryland. It is recognized that court action may necessarily modify this program and that economically depressed communities in the basin may have to depend on outside financial assistance.

"4. The establishment of a technical committee consisting of representatives of West Virginia, Pennsylvania, Maryland, the Ohio River Valley Water Sanitation Commission, and the Federal Government to explore the means of abating pollution caused by coal mine drainage is recommended. This committee would be charged with determining the amount of pollution from such mines. The committee also would be charged with developing a remedial program, including a cost estimate."

In accordance with recommendation No. 4, the Technical Committee was established with the recommended representatives.

The Technical Committee of the Monongahela River Enforcement Conference held its objective to be:

"To determine the sources, types, and amounts of pollution from coal mines in the Monongahela River Basin, means and cost estimates for abating such pollution."

To carry out this objective the committee established the Monongahela River Mine Drainage Remedial Project. The committee detailed a scope of work for the Monongahela Project to accomplish these objectives. This work included the search of existing State records of mines located during the joint Federal-State program of 1935-1939. Field maps and aerial photos for the study were procured and methods to describe and sample sources were developed.

The actual work of locating, sampling, and describing the sources of mine drainage began in January 1965 and continued through May 1968. This was accompanied by the location of and sampling at stream stations throughout the basin to provide information on the effects of mine drainage on the stream water quality.

The large amount of data and variety of information to be acquired necessitated the use of automatic data processing methods.

Further programs, other than those for the initial data retrieval, were developed to assist in analyzing the data as well as to improve capabilities of storing, updating and retrieving data. For purposes of inventory and reporting of results, the total area of the Monongahela Basin was subdivided into thirty smaller drainage areas. Detailed data, including site location, description, and discharge data were developed for each sub-basin.

Those sub-basins are outlined and numbered on this

A. D. Sidio

chart here on the wall.

During the inventory, which continued from January 1965 through May 1968, a total of 7,002 sites associated with coal mining were located and described. The relative distribution of the types of sites that were inventoried is shown in Table 1 of this document. (See "Mine Drainage Report to Conferees.")

The types of sites that were inventoried were: Preparation Plant, Strip Mines, Strip and Auger Mines, Drift Mines, Strip and Drift Mines, Shaft or Slope Mines, Refuse Piles, Shaft and Strip Mines, and Coal Storage Areas.

Table 1 breaks these down into the inactive sites, with the percent of total, the total number of sites, for instance, from preparation plants -- 42 inactive sites were located, that amounted to 0.6 percent of the total number located or the 7,002.

Now, the drift mines, of course, are the largest number as indicated here in this table. They represent 48 percent of the inactive sites and some 4 percent of the ones that are active, 4 percent of the total numbers that were inventoried.

Inactive sites constituted 92 percent of the total. Inactive drift mines constitute nearly one-half of the sites and inactive strip mines account for about one-third of the sites.

Of the 7,002 mine and mine-associated sites, 3,046 were draining at the time of the inventory. Table 2 contains data on the draining sites. (See "Mine Drainage Report to Conferees.") This, again, gives the number of sites that were draining at the time of the inventory, lists them as active and inactive, and indicates from the analysis made of those discharges the total net acidity and the total iron in pounds per day each discharged from the combined sources.

The total net acid load from all coal mining sites in the Monongahela River Basin was 1,079,575 pounds per day, and the total iron load was 302,896 pounds per day. This data does not reflect the additional pollution of other chemicals or sediment which are found in mine drainage.

The data of Tables 1 and 2 are combined and presented as percentages of total in Table 3. (See "Mine Drainage Report to Conferees.") The following items are of particular significance in Table 3:

1. The most potent source of mine drainage pollution was active mines. Active sites comprised only 8 percent of all sites and 10 percent of the draining sites, but even with the treatment plants existing at the time of inventory, the active sites contributed 35 percent of the total net acid load and 40 percent of the total iron load in the basin.

2. Underground mines are the source of most acid mine drainage. Underground sites, both active and inactive, comprised 55 percent of all sites, 61 percent of the draining sites, and contributed 71 percent of the net acid load and 82 percent of the iron load.

3. Inactive underground sites contributed 43 percent of the net acid load and 47 percent of the iron load and thus are the largest contributors to stream degradation.

If it is assumed that the drainage from combination underground-surface sites originates primarily in underground mines, then underground mines were responsible for nearly 88 percent of the net acid and 91 percent of the iron entering Monongahela River Basin streams. By this assumption, the contribution of inactive underground mines was about 55 percent of the net acid and 54 percent of the iron.

Another approach to locating the problem is to tabulate the relative distribution of pollution sources within the Monongahela River Basin. A portion of this tabulation is shown in Table 4. More complete tabulations were too voluminous to fit readily into a table. (See "Mine Drainage Report to Conferees.")

The following comments are noted as a result of these tabulations:

1. The pollutional contribution from all types of

active mines was greatest in the Middle and Upper Monongahela River, Lower West Fork River, Lower Tygart River, Lower Cheat River, Lower Youghiogheny River, and Sewickley Creek sub-basins. Discharge from active underground mines were the primary source of stream degradation only in the Upper Monongahela River sub-basin.

2. Water quality in watersheds in the central portion of the Monongahela River Basin was degraded by pollutants from both active and inactive mine sources, and water quality in the headwaters areas was degraded principally by pollutants from inactive mine sources.

3. It was generally true that approximately 20 percent of sources in an area contribute 85 percent of the net acid pollution. This becomes apparent upon detailed study of the individual sub-basins. The average amount of net acid contributed per source varied greatly among the sub-basins.

Yet another approach exists to identify problem areas in the basin. Estimates are made of the total lengths of the streams in the basin that were affected by mine drainage. Results of the study reveal that 2,410 miles of streams were affected by mine drainage. An affected stream was considered one that contained mineralization from mine drainage in concentrations noticeably in excess of background levels. Mileage figures are presented in the form of sub-basin totals in Table 5 (See "Mine Drainage Report to Conferees.") The mileage determinations are based on field observations, analytical data, and knowledge of mine drainage source locations. In the right-hand column of Table 5 are listed the ratio of the stream miles affected by mine drainage in each sub-basin, to the estimated total miles of streams. In this way, a relative factor is assigned for each defined study area to provide a basis of comparison of the pollution problem.

As indicated by the ratios, the Lower Cheat River, Elk Creek, Middle Monongahela River, Lower West Fork River, Lower Tygart River, Redstone and Dunlap Creeks, and the Upper Monongahela River sub-basins had more than 40 percent of the streams affected by mine drainage. The Laurel Hill Creek and Upper Tygart Valley River areas were affected only slightly.

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Abating pollution from inactive mines is a task the cost and success of which are difficult to accurately predict at this time. The difficulty derives from the fact that there is little experience with watershed-scale abatement projects upon which to base estimates.

Order-of-magnitude cost estimates have been prepared to indicate the potential amount that might be necessary to implement a comprehensive program for abating pollution from inactive mines. An estimate of feasible and economical remedial work in each sub-basin was prepared. These estimations of at-source abatement were totaled for the entire Monongahela River Basin as shown in Table 6. (See "Mine Drainage Report to Conferees.") A unit cost was estimated and applied to each type of measure suggested. The total estimated costs in Table 6 were obtained in this manner. In two sub-basins, No. 1 and 2, a total of six lime neutralization treatment plants placed near mine drainage sources are recommended. An initial construction cost of $2,141,000 and an annual operating cost of $625,000 are projected. To this must be added the costs of engineering design, acquisition of land and mineral rights, the costs of maintaining the constructed facilities, and other miscellaneous costs. There is no way to estimate such costs as acquisition of land and mineral rights at this time. In a comprehensive program, such costs could be great, since areas might be involved that include substantial minable coal reserves. The total of these "at source" costs is approximately $60 million.

A major defect in the cost estimate is considered to be the cost for underground mine sealing. This estimate is considered defective because the strip mines in areas of early underground mining created more openings to underground mines than originally existed and left many of these openings covered. Preliminary surveys of the present type are not adequate in such situations. If the assumption were made that all areas would be as complex as ones that have been examined in detail in the Upper West Fork River area and in the Upper Tygart River area, the cost of mine sealing alone could be more than 10 times the amount shown in Table 6 or more than $486 million.

To summarize: The initial estimated cost of a comprehensive program for at-source control of acid mine drainage from inactive sites in the Monongahela Basin would exceed $60 million and might be greater than $498 million. Calculations of the data from the Monongahela River Basin inventory have shown that many problems exist in arriving at definite

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pollutional load values. This also has been true in arriving at methods to be used for the control of mine drainage. The total aspect of mine drainage treatment or control is a vastly complicated problem. Definite procedures to be used for loading evaluation, treatment or control methods, and the resultant cost analyses for the partial or complete solution to the problem are not possible, based on the type of information requested and obtained. Experience has indicated that because of mining methods and mine conditions the actual number of openings is often as much as 10 times the number visible.

To be completely effective, the program would probably need to be supplemented by treatment. If at-source control of drainage from inactive sources were only 50 percent effective, then treatment plants would be needed. Present data indicate that the initial investment in treatment plants to neutralize net acidity from all inactive sources, exclusive of sub-basins 1 and 2, would be in the order of $21 million, and plant annual operating costs would be about $6,132,000. The total estimated cost for the additional water treatment over a 20-year period would be about $144 million. The cost of the collection systems to transport mine water to the treatment plants may be from one to 20 times more than the cost of the plants. Total estimated costs for at-source abatement and water treatment range from $218 million to $656 million for a 20-year period.

It should be reemphasized that these costs are only presented to indicate the order of magnitude of funds required. Meaningful estimates can only be obtained by working with small representative areas on a trial abatement basis to obtain data that are reliable and representative.

As a result of the findings of the Technical Committee, the Technical Committee agreed on these following recommendations to be submitted to the conferees:

1. A Remedial Project committee for the Monongahela River Basin be established to direct and coordinate the abatement programs recommended by the conferees. The committee shall be comprised of representatives of West Virginia, Pennsylvania, Maryland, ORSANCO, and the Federal Government.

2. In the event that funds are made available for application to the abatement of mine drainage in the Monongahela Basin, that appropriate State, interstate, and Federal agency delegations of authority be given to respective State, interstate, and Federal officials who are members of the Remedial Project Committee to enable said officials to commit the allocated funds.

3. The Remedial Project Committee be chaired by the Federal representative and be charged with, but not

limited to, the following responsibilities:

a) to develop methods to assign priorities to areas or sub-basins that are to receive abatement measures. These methods shall be based on sound technical principles consistent with attainment of the established water quality standards;

b) to establish priorities for areas or sub-basins in accordance with the methods developed;

c) to have prepared more finite estimates on the cost of selected projects;

d) to review and evaluate State programs in the basin for abatement of present and future pollution from active mining operations;

e) to evaluate progress and accomplishments of abatement projects;

f) to determine financial assistance required by the States to carry out selected abatement projects;

g) to prepare progress reports for submission to the conferees and the Secretary of the Interior by July 1 of each year.

And I will note here that these recommendations were prepared by a Technical Committee while the Federal Water Pollution Control program was still in the Department of Interior; since they were the recommendations of that

Technical Committee they are submitted in that manner here. I am sure that those committee members would not disagree with changing that to Administrator, Environmental Protection Agency.

4. The FWPCA provide the technical staff to assist the Remedial Project Committee in accomplishing the assigned responsibilities.

5. A legal study be financed by the FWPCA covering an analysis of legal problems in abatement and control of water pollution from mining and associated functions. Model legislation be developed based on:

a) a study of patterns of ownership of mineral rights in the basin;

b) a study of possible State legislation aimed at determining methods to:

1) obtain right of entry for reclamation work;

2) assure public benefit from reclamation work.

6. The State Governments will adopt and enforce a program to abate present and future pollution from active mining operations; establish and define who will be responsible for preventing pollution from mines that are presently active and will be inactivated in the future, as well as the establishment of this responsibility for all future mines prior to their development; and develop a

program for maintenance and operation of abatement facilities and measures.

7. That the sum of $5 million be made available to be used for the purpose of initiating engineering studies to determine specific project costs, and to fund agreed-to projects. As finite engineering estimates are completed, funds would then be requested in accordance with State plans and priorities as established by the Remedial Project Committee. These initial projects would indicate the degree of effectiveness and feasibility of basinwide mine drainage control. In addition, these projects would provide a means for the Remedial Project Committee to refine the rough estimates prepared from the existing inventory.

Now, in the preparation of these recommendations, there were recommendations submitted by the State and interstate agency representatives on the Technical Committee. The individual recommendations submitted by those groups are included in the larger overall Technical Committee Report.

Mr. Chairman, that concludes my report. I do have a memorandum to the Chairman of this conference concerning the legal problems of coal mine reclamation and drainage abatement in Appalachia.

I would like to request to read this memorandum into the record.

MR. STEIN: Do you want to read it or just enter it into the record? You can read it if you wish.

MR. SIDIO: You all have it, then, fine, I'll just have that included in the record.

MR. STEIN: That will be entered into the record as if read. For those who may wish to read that here, that is appended in the back of that report and is available for perusal here. (See the two concluding pages of "Mine Drainage Report to Conferees.")

MR. SIDIO: This is all I have, Mr. Chairman.

MR. STEIN: Are there any comments or questions?

MR. McKEE: Mr. Chairman.

MR. STEIN: Yes, Mr. McKee.

MR. McKEE: Andy, could you give us a better definition of your meaning of "inactive mines," whether you are referring to abandoned mines or those mines that are really still in operation but temporarily inactive?

MR. SIDIO: In the inventory, Mr. McKee, those that were listed as inactive were those that were not in operation at the time; coal was not being removed from that particular mine at the time of the inventory.

Those listed as active were those from which coal was being removed at that time.

MR. McKEE: Then you actually do not have an inventory of the truly abandoned mines.

MR. SIDIO: I am not sure that we really have a definition of what a truly abandoned mine is. It may be abandoned and, as you know very well, abandoned for a matter of years, and somebody will reopen it for the removal of additional coal that may be available.

MR. McKEE: Thank you, Mr. Chairman.

MR. STEIN: Yes.

Mr. Lyon.

MR. LYON: Mr. Chairman.

Mr. Sidio, in 1963, the conferees charged the committee and in turn presumably the committee the staff to develop a remedial program. And in reviewing the minutes of the committee, I notice that Mr. Heine, who represented Pennsylvania on the committee at a number of meetings, pointed this out, highlighted the importance of carrying out that assignment, and then on December 26, 1969, Mr. Horton wrote to you and also indicated that the report is deficient because it does not include a specific remedial program.

My question is: Why does it not include a remedial program?

MR. SIDIO: The reason that the report does not include a remedial program is that the committee had agreed quite sometime prior to my entry into that committee what the charge to the committee was. That was to, as I recall — I think it is quoted in here —

MR. LYON: If I can help you, on page 4, item 4, it says: "The committee also would be charged with developing a remedial program, including a cost estimate."

My question is: Where is the remedial program?

MR. SIDIO: The remedial program is suggested on a broad basis of sealing and treatment. I think that is about as far as this committee could possibly have gone with the information that was available; and the cost estimates, as indicated here, are based on very rough information.

MR. LYON: I don't want to belabor this point, but in the discussions during the committee, Mr. Heine from Pennsylvania, repeatedly indicated that that was not adequate and what was needed was a list of priority projects — the kinds of projects where a great deal of abatement could be accomplished with a minimum amount of public money. If you will review the minutes in 1969, this was repeatedly said by Mr. Heine, and then Mr. Horton wrote you on December 26, 1969, and he said, "The report, as it now stands, is deficient in not recommending priorities for undertaking specific abatement projects should funds for this purpose be made available. Neither does the report offer guidelines or criteria to be considered in establishing priorities. These are matters that are inherent in the charge to the Technical Committee which among other things included instructions to develop a remedial program."

MR. SIDIO: I don't think that there was any charge to the committee to establish priority areas, and I do recall the letter from Mr. Horton, but nonetheless I don't think that this was a charge to the committee as originally assigned by these conferees.

MR. LYON: Well, then, how are we going to get the mine drainage cleaned up if we don't have a priority list? You indicated that the total cost would be between $60 and $600 million. How can you go to Congress or to anybody else without a priority list? They are not going to give you that much money at one time. They may give you a fraction of that. And my question is: Where do you start?

MR. SIDIO: I don't think that there are sufficient data in this inventory to select the priority areas within this sub-basin or within this basin.

MR. LYON: How do you suggest we get that data?

MR. SIDIO: It is suggested here that a committee be established for the purpose of setting up priority areas.

MR. LYON: Well, Mr. Sidio, I have trouble with that, because I don't think the committee is going to go out and collect all that data. If you need more data, did you recommend that EPA get more money to collect this data -- this additional data that you feel is needed? Certainly a committee isn't going to go out and collect.

MR. SIDIO: The recommendations also include the fact that the EPA will -- or FWPCA will provide, I believe, technical support to that committee.

MR. LYON: That is the only question I have.

MR. STEIN: I think, Mr. Lyon, that is a very fair statement, and I have the same reservations on the report that you do. However, I might suggest to the conferees here that the Technical Committee has had a fair run at this. I think there are a lot of aspects in this report. I don't want to be too negative about this, but I think there are a lot of aspects in this report which have brought us out a real long way. It looks very easy, in a way, when you see the analysis, but there are many aspects of this analysis that we didn't have before.

I think, however, Mr. Lyon, you put your finger on this — that we have to set up an approach and a priority item to get a system of priorities to get at the problem, and I am not sure that a technical committee can do this.

But as I see it, here is what we have now that we didn't have before — of course, we have a statement, and possibly we didn't quite have this before, of the seriousness of the problem -- the belief possibly that the Monongahela is more intensely polluted by mine drainage than any other river in the United States. That means if we have this problem facing us, and this is the challenge, I think, we have to work at this.

Now the other problems I think that this Technical Committee pointed out were: 1) they suggested several areas here possibly in dealing with control of active mines and 2) certain areas where we can clean up a relatively small amount, or percentage of the sources, and get a much higher return on reduction than if we just went everywhere. I have no basis of making a judgment here. But I think this is estimated here, for example, if the assumptions are correct, that 85 percent of the drainage comes from certain mines and we locate those mines, that might be a priority. Or if 8 percent of the openings -- and these are controlled by active mines with responsible parties -- are contributing between 35 and 40 percent of the load, I think again we have something to work on.

I would suggest to the conferees, and I would like you to consider this -- I don't know that we need any more; "any" is a big word -- I don't know that we need any primary emphasis on further inventorying or further data, and I recognize that I have never seen a technical committee yet that didn't come forward with a recommendation that they needed further study. This is inherent in any committee you ever have.

But I would suggest that the conferees may want to consider the analysis made by the Technical Committee in this report and see if we have not gotten a few facts here which will enable us to come up with a remedial approach. I just want to repeat these two essential things, because I think they are both very, very important: 1) If we say that 8 percent of the sources are contributing say 35 percent of the acid and 40 percent of the iron, if these can be controlled and you can find the people responsible for this, we have gone a long way to cleaning up pollution of the Monongahela. Then, 2) if it is said that approximately 20 percent of the sources in the area contribute 85 percent of the net acid pollution, if this is a proper judgment and evaluation and assumption, then it seems to me that our priorities are pretty well lined up.

What we should do is get a program where we can zero in on the 20 percent or make a start on that 20 percent, and if we can demonstrate that we are going to clean up 85 percent of the pollution by getting at 20 percent of the sources, it seems to me that these are the first ones that we may want to consider to get at.

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In other words, gentlemen, I do think that there are very, very many good points in the study, that the study very possibly points a way that we can move with this. I think that it perhaps was too much to ask the Technical Committee to come up with a program for this.

I have one more comment, and I don't want to be too hard on this, but I know the Technical Committee talked about assigning financial responsibility to them to disburse money to get $5 million from "Uncle" for a certain portion of the program.

I think as far as the States and we are concerned, this question of disbursing money is governed by State and Federal law, and we just have to be governed by that. I wish all of us could speak knowing the amount that we were going to make available for each project. If we could just make a request, okay. But we have State legislatures, and the Congress has the control of the funds. We will have to take that into account.

While we are aware of the purport of these recommendations, I think you have to recognize that all of the administrators represented at the table here are governed by the fiscal constraints in State and Federal law.

So I think in those two areas -- the one on the suggestion on how we finance, and Mr. Lyon's point that we have not come up with a remedial program -- are two things that the conferees may address themselves to. However, I would suggest, again, that we take this report -- and I think it is an extremely valuable and probably a pioneering breakthrough report -- and look at the positive aspects of it and the analytical aspects of it on which we can base a remedial program.

Now, I think a lot of us have thought about this, and very possibly the Federal people and hopefully the State people right here can come up with suggestions on a remedial program that we can agree to at this conference and go ahead with it.

Are there any more comments or questions? If not, thank you.

MR. McKEE: Mr. Chairman.

MR. STEIN: Yes, Mr. McKee.

MR. McKEE: I simply want to make Maryland's position clear here that we do not accept the recommendations as proposed in this document and will have several suggestions for modification to those recommendations at a later time.

MR. STEIN: Yes, I hope so.

Now, what I would hope -- when you say "later time," you mean at this conference?

MR. McKEE: At this conference. Yes, sir. Today.

MR. STEIN: That is why we are here.

All right. Thank you very much, Mr. Sidio.

Before we get into the Federal recommendations, I think we have to think about this, too. Let us hear from Colonel West, at this point, so he can meet his other obligations.

Colonel.

STATEMENT OF COLONEL EDWARD C. WEST,
DISTRICT ENGINEER, PITTSBURGH DISTRICT,
ARMY CORPS OF ENGINEERS, PITTSBURGH, PENNSYLVANIA

COLONEL WEST: My name is Colonel Edward C. West. I am the District Engineer for the Army Corps of Engineers, Pittsburgh District, And, at the moment, I am in a bit of trouble weighing the importance of making this statement before the meeting goes any further against an already late commitment to a Congressman, whose wrath I don't want to incur and a bit of a bladder problem that I have at the moment.

I can't resist by starting this off by describing my feelings as I walked into the meeting this morning, and I think these can best be described by waxing poetic for a moment. The poem I am going to give you is slightly off color -- so pardon me, ladies -- but in the permissive society that we live in today, I think you will forgive me being slightly off color to make a point.

The poem goes something like this:

A fairy, whose name was Sol Bloom,
Took a lesbian up to his room,
And they argued all night over who had the right
To do what and with which and to whom.

I don't want you to get the idea that I state that in a demeaning way, so I would like to start off by congratulating the Technical Committee on doing what I think is a magnificent piece of work. We have heard -- all of us -- the definition of a camel as being a horse designed by a committee, and this simply highlights the difficulty that a committee has in coming up with something that is really concrete in the form of a plan of action. This has to be done by an action agency rather than by a committee. A committee can do the initial leg work, and I think that has been done, and it has been very well done.

I am somewhat sorry that my Agency views this meeting today as the resurrection of a mission that was undertaken some 8 years ago. Unfortunately, we haven't been very active in this effort, and I am not sure I know why -- whether it was an oversight on the people who organized it, or an oversight on our part for not taking a more active part in it.

At any rate, I think we are faced with some pretty considerable coordination problems. There are a lot of things going on in the Monongahela Basin that relate to this particular effort, and sometimes it is very difficult to determine what comes first, the cart or the horse.

The State of West Virginia is working on a Type 4 study for the West Virginia portion of the Monongahela River. The State of Pennsylvania is working on a mine acid program for the Youghiogheny River, which is one of the major tributaries to the Monongahela, and they have completed Phase 1 of their report. It is a very fine report. Those of you who haven't seen it should read it.

My office is working on two dams down in the headwater areas: Stonewall Jackson Lake and the Rowlesburg Lake, and Rowlesburg particularly is a source of much controversy these days.

We are also doing some pioneering efforts particularly in the mine acid drainage area as it relates to water quality. And much of this was generated by some very penetrating questions which were asked of us by one of the gentlemen seated at the head table, Mr. Ed Henry, representing the State of West Virginia, from the Department of

Natural Resources. And we are about to embark -- and this will be news to you, Ed -- on a major study. We are trying to get official sanction of it right now to answer those questions that you asked us in a letter sometime ago, and I think you will be very pleased with what we intend to do here.

The Joint Industry Group, which is a very active group in the Pittsburgh area, has proposed a specific project in the vicinity of Irwin, Pennsylvania, to solve two problems: 1) to abate mine acid drainage and 2) at the same time to make this acid drainage or this polluted water into drinking water to solve another problem that exists in the Irwin area.

All of these things somehow or other have to be brought together.

I might interject at this point that we will submit a confirming written statement substantially the same as what I am saying to you now, and it will be submitted before the 30-day period is up -- hopefully within the next week or so. We would have submitted it today, but we were on somewhat strange ground here not really knowing what was going on.

MR. STEIN: I guess so. You know we may be resurrected, and the reason we are resurrected, we have a lot more friends in environment. But one of our charms of resurrection -- we have our own rules. We don't really have the 30-day period like the Corps hearing. We have adopted a lot from the Corps, but really not all of your rules.

COLONEL WEST: How many days may we have, Mr. Stein?

MR. STEIN: A week.

COLONEL WEST: We will get it in, in a week then. The gentlemen at the table here told me 30 days. That is why we were using that. We can write it tonight or tomorrow though; that is no problem. (See pp. 215-218)

Coming back to more meaty things, I think the big challenges that are before us now are in the planning area, the estimates area, the engineering area, the construction area, and particularly in the funding area. These things, it strikes me, are all fortes of the Civil Works Organization of the Army Corps of Engineers. So my general rhetorical question to the conferees is: Where do we fit in? I should think that we would be able to provide a considerable service here.

I think Mr. Lyon's very penetrating questions to the report of the Technical Committee probably highlight where we are right now. And I think where we are is at the point where some very constructive, worthwhile, excellent, outstanding leg work has been done, and now it is the time for a doing agency to come into this and be assigned a specific mission, be provided with the funding or the method of getting the funding and get on with the job. I, therefore, propose to put into my written report something on the order of the following statement: If the remedial project committee, or something like that, is organized, the Pittsburgh District of the Army Corps of Engineers wishes to be an active participant. I realize that the two Federal Agencies that probably can contribute the most to this effort are the Environmental Protection Agency and the Army Corps of Engineers.

I think it is academic whether the effort is chaired by the EPA or by the Corps of Engineers. I don't think there should be any pride of authorship here. So I offer to the conferees that we would be willing to chair this effort and be assigned one or more major missions or a mission for the overall effort, but I leave that to you to sort out. We are at your disposal for anything you want from us.

In summary, Mr. Chairman, I would like to thank you very much for considering my threefold problem. I have to depart now to do those other two things, and Mr. Ben Netzer — would you stand up for just a minute, Ben? — is one of our Senior Engineers. He will remain here throughout the rest of the conference. If you continue tomorrow, I hope to stop back myself. Mr. Netzer is authorized and perfectly capable of answering any questions and participating to the extent that you desire. Thank you again for your very kind consideration.

MR. STEIN: Thank you, Colonel, for your statement and welcome aboard. We are glad to have you. I know, I have been going before the same committees of the House and Senate for 20 or 30 years with the Corps, and we have always worked very closely with them. I hope we will continue that in the future.

I think particularly one procedural point that Colonel West made was very pertinent, and at this point we will take a 10-minute recess.

(Short recess.)

MR. STEIN: Let's reconvene.

I hope I am not going to open the flood gates here when I ask the participants in the next colloquy to remember that we would like to push the program forward. But I think that in accordance with trying to do this in the fairest way possible, Mr. Sidio is back, and certain statements were made about the aspects of the Technical Committee Report and a suggestion of the Pennsylvania representative, and

Mr. Sidio has some comments he wishes to make.

Mr. Sidio.

MR. SIDIO: I would like to bring to the attention of Mr. Lyon the request of Mr. Heine made during a Technical Committee meeting February 26, 1969, Wheeling, West Virginia. The statement made -- and this is a direct quote -- "In your reports I would suggest that you do not mention any projects. We would prefer the watershed approach." That is exactly what has been done in the report submitted by the Technical Committee. I don't know that it was done specifically at the request of your representative, but it was certainly done in the manner that he suggested.

MR. LYON: Well, I don't think that a discussion of this should turn into what Heine did or didn't say. I think what we should talk about -- and I think this is very relevant, Mr. Chairman -- is what did he mean and what do we mean, and what do we mean by an abatement of -- well, an abatement program. I think what Heine meant when he said that is that we shouldn't pick projects all over the basin that would only clean up a part of the watershed. What he meant was that we should pick off the watersheds where we would get the biggest pollution abatement bang out of the buck, and he referred in that meeting on February 26 repeatedly to the very fine work that EPA did on the Susquehanna River.

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He said the Susquehanna River Basin had a point system with a priority list on how to attack and clean up pollution, and he said try to use the point system and work it into the report that priorities are to be made, get a proposal and discuss what schedules are to be followed. Step 1 should be to set what the priorities would be.

I agree with the Colonel that a fine job has been done so far. My only quarrel is that the job isn't complete, that the remedial program has not yet been developed, and that is what Heine was trying to say. EPA did a very fine job specifically doing that in the Susquehanna, and if you follow what was done in the Susquehanna, you have what, at least in the mind of this conferee, is a good remedial program.

MR. STEIN: Are there any other comments or questions?

As far as I can see, I think we are very close together on this, and there is no dispute on this. If the statements are correct of the Technical Committee -- and I have every reason to believe that they are pretty nearly correct -- I think it should be pointed out that we have a multiple-agency and we possibly have a complicated problem in the Monongahela River because we are dealing with 7,000 sources, half of which flow and half of which don't flow. I recognize the problem you have on that, because in any of the fields -- particularly the one we deal with -- those negatives are the hardest to prove. If you go out and find something that is flowing all of the time and is a big source of pollution, you know where it is, and you are going to abate it. If it is intermittent, you really have a hard time proving it. When these are interconnected, as they are here, we have a problem.

Again, let us really look at the problem that we have so far. As I see it, we have had an analysis of the river basin. I think that the Technical Committee Report -- and all of the States and the Federal Government agree with at least the factual basis of the report -- indicates that if we concentrate on certain specific types of operations or areas, we are going to get a higher commensurate return for our effort than we will if we just went through the basin. I think it is for the conferees to analyze this to see what these areas are, set up a priority program, see how we can get to them -- whether there are people who are responsible and who have to clean it up within a time schedule, or whether a public agency has to take that on. If the public agency has to take it on, who is going to be responsible for funding and set a priority?

Now these are the problems. I believe that if we are talking in terms of magnitude, in hundreds of millions of dollars, and possibly divergence in cost in a magnitude of the order of 10, we can't, I think, as Mr. Lyon pointed out, ask for all this money at once. We have to take the first step or the first steps and get moving with a coordinated program.

Again, I think there are some very obvious implications on this report, and the implications are that we have sources under the control of private parties who possibly can be held responsible, and also sources which are abandoned or inactive, as you wish, where you can't find the responsible party, but there is still a significant source. We are going to have to devise a method to get at these sources, even though we can't find a party whom we might, in the traditional sense, hold legally responsible.

I think we have got the problem fairly well laid out for us, and thank you.

MR. SIDIO: I have just one additional statement to make, and that is that I did serve as the Federal representative and as chairman of that Technical Committee for the latter 3 or 4 years of its existence. And at this time I would like to take the opportunity to thank all of the States and ORSANCO for the very excellent cooperation that we did get from the States and the agency and the committee representatives in the work that we accomplished through that Technical Committee.

MR. STEIN: By the way, Mr. Sidio, I am glad you brought that up. I wonder if we could have, for the record, a list of the people's names from the States and Federal Government who did participate in this? It is in the main report, but I think this should be inserted in the record right after your remarks so it does get a degree of prominence in the record.

MR. SIDIO: This might make up quite a list. You know there were a few changes that occurred.

MR. STEIN: Well, I think the bigger the honor roll, the better we like it.

MR. SIDIO: It will take me sometime to get that list together.

MR. STEIN: You also have a week. If the Colonel can do it in a week, and the Corps of Engineers, I know that the Chief of our Field Investigations Center in Cincinnati can at least match that.

MR. SIDIO: Thank you, sir.

(The list above referred to follows at page 52.)

Members of the Technical Committee that assisted in the preparation of the Summary report and the recommendations contained therein.

Pennsylvania - Walter Heine
West Virginia - Edgar N. Henry
Maryland - Michael Rodevick
ORSANCO - Robert K. Horton*
EPA (FWPCA) - A. D. Sidio

Other persons serving on the Technical Committee from 1964-1970

Pennsylvania - Russell Klingensmith*
West Virginia - Houston R. Wood
- Bern Wright*
Maryland - Paul McKee*
- Silvin Belkov
ORSANCO - William Kline
Department of HEW - Kenneth Biglane*

*Original committee members

MR. STEIN: At this point, we would like to call on Mr. Lowell Van Den Berg for Federal recommendations.

Mr. Van Den Berg.

STATEMENT OF LOWELL A. VAN DEN BERG,
DEPUTY DIRECTOR, DIVISION OF FIELD
INVESTIGATIONS, ENVIRONMENTAL PROTECTION AGENCY,
CINCINNATI, OHIO

MR. VAN DEN BERG: Mr. Chairman, conferees, ladies and gentlemen. I am Lowell Van Den Berg, Deputy Director of the Division of Field Investigations, Cincinnati, Ohio.

The Federal recommendations to the conferees are as follows:

MR. STEIN: Mr. Van Den Berg, I think we should point out -- were tentative Federal recommendations mailed to the conferees?

MR. VAN DEN BERG: They were.

MR. STEIN: Are these the same or are they changed?

MR. VAN DEN BERG: There are some dates, some time limits put into these that were not in those originals.

MR. STEIN: I think this should be pointed out. This is not identical to what was mailed to you.

Go ahead, Mr. Van Den Berg.

MR. VAN DEN BERG: 1. A Remedial Project Committee be established, and the following agencies be represented, with the Federal nominee to act as chairman: Environmental Protection Agency, Pennsylvania, ORSANCO, West Virginia, and Maryland.

In the event of the resignation or disability of a member, a replacement shall be promptly designated by the Federal or State Government which designated the resigning or disabled member. For the purpose of transacting committee business, four shall constitute a quorum.

Committee meetings shall be called by the chairman.

Technical assistance shall be furnished to the committee by the Environmental Protection Agency of the Federal Government, Office of Enforcement-Water.

2. The committee shall:

a) Within 3 months select a pilot project to determine the cost and feasibility of reclaiming within a complete watershed streams damaged by sedimentation from mine drainage.

b) Within 6 months prepare a plan for setting priorities for the abatement of mine drainage from inactive mines.

c) The committee shall report in writing to the conferees on the first of July of each year the progress being made by each State in terminating pollution from inactive mines.

d) The committee within 3 months shall prepare a program for inspection of abatement measures and treatment facilities at all active mines.

3. Within 6 months the waters discharged from all active mines shall meet the following criteria or the State water quality standards, whichever is more restrictive: pH between 6 and 9 standard units; no net acidity; and total iron concentration of 7 milligrams per liter or less. Discharges from facilities installed to abate pollution from active and inactive mines shall meet the same criteria.

4. All mine operators are immediately to institute procedures to control and prevent sedimentation in the water courses. These remedial measures are to be completed by January 1, 1972, at which time the effluent shall contain no settleable solids or sediment in excess of 1,000 Jackson Turbidity Units 4 hours following a major precipitation event, as defined by the U.S. Weather Bureau, and not over 200 Jackson Turbidity Units 24 hours thereafter.

5. All mine operators opening new mines or expanding mines already in operation shall abate water pollution both during mine operation and after mining

activity has ceased. Abatement plans shall be submitted to the appropriate State agency 6 months prior to commencement of mining. Mining activities shall not begin until the State agency has reviewed and approved the plan.

6. Each State shall report quarterly:

a) A list of new and reopened mines;

b) A list of active existing mines which became inactive during the quarter;

c) The status of actions to control pollution from the closed mines.

7. The Federal Government is requested to furnish funds for committee expenditures and for the pilot project heretofore mentioned.

That constitutes the Federal recommendations.

MR. STEIN: Are there any comments or questions?

MR. LYON: Mr. Chairman.

I think we all need to digest some of these changes and also try to blend them in with what the committee itself recommended. Maybe we can get back to this later in the day.

MR. STEIN: I think that is correct. I have certain technical questions.

Go ahead.

MR. McKEE: I would like to have a copy of the recommendations distributed to the conferees just as rapidly as possible since they are different from the ones mailed to us.

MR. STEIN: That will be done. Are we working on that now?

MR. COOK: How soon?

MR. RILEY: They are being copied now.

MR. STEIN: All right.

Will it be possible to have these in the conferees' hands within the next 15 or 20 minutes because I do think they need them now?

I have several technical questions. Part of this looks like you are writing a constitution in talking about quorums and stuff. The reason I ask this is that you have two problems. You have five agencies. You are saying, for the purpose of transacting business, four shall constitute a quorum, and then we have a monthly deadline giving them 3 months to do something. Is that correct?

In other words, if we get two absentees from a meeting, you may not be able to do something for 2 months.

MR. VAN DEN BERG: That is possible.

MR. STEIN: And you have to come up with a report within 3 months.

Another doubt — I am just raising these

questions. The other question -- and I think we have done this before -- you say the Federal Government is requested to furnish funds for committee expenditures, and then you talk about Office of Enforcement-Water, and that means we are going to have to put the money out.

MR. VAN DEN BERG: Right.

MR. STEIN: And there are two items here -- I would just like to talk in terms of this money -- one for committee expenditures. This might be great, but if you have to come up with a report in 2 months or 3 months, and you have a quorum operation, what assurance have we got if we put out the funds for the committee --

MR. VAN DEN BERG: None.

MR. STEIN: -- that we are going to get the result we are paying for?

MR. VAN DEN BERG: Well, I think you will get the result you are paying for. You may not get the particular report at the time you want it.

MR. STEIN: Well, I think we have to have an agreement if we are going to get a report in 3 months. What I am getting at is: we have to set the time schedule to do this. If we are going to be prudent with the expenditure of Federal funds -- it is just like signing a contract. If we sign a contract to get some piece of equipment delivered, I don't have to worry about whether the manufacturer has a quorum when he opens his factory in the morning.

MR. VAN DEN BERG: Right.

MR. STEIN: In other words, I think you may want to consider that.

The next question I have is: How much money are you talking about for that pilot project?

MR. VAN DEN BERG: We had a number down there which we decided to take out. One of the fallacies in putting a number on a project before you ever start, of course, is that if the cost runs over that, you have to justify to somebody why it was higher. If it is lower --

MR. STEIN: I just want an estimate. The point is -- and I am just raising this as a technical question -- there is a limit, as you know, to sums we can put our hands on for this, I would like to know whether this is in the ballpark.

MR. VAN DEN BERG: I think it would be, Mr. Stein.

MR. STEIN: But you don't care to mention a figure now?

MR. VAN DEN BERG: Yes, we had a value in there of $5 million. We decided to take that out primarily because when you put in a number, if you accept that, somebody either wants to spend all of that money, or if the project spends over, they want to know why. I think the better approach would be to select, on the basis of the recommendation or the recommendations of the representatives -- at least of the conferees from their technical knowledge -- a small project that could be done, and come up with a decent estimate when we do make any statement on funds required.

MR. STEIN: In other words, you are going to select the pilot project within 3 months, but you are not going to need any of the funds within 3 months --

MR. VAN DEN BERG: I would guess --

MR. STEIN: -- except as to finance your committee expenditures.

MR. VAN DEN BERG: Right.

MR. STEIN: Is that correct?

MR. VAN DEN BERG: That is right.

MR. STEIN: All right. And do I also understand that this is a clarifying operation and, if you are going to request funds for the pilot project, the Federal Government has to go through its usual procedures in getting funds for any project? In other words, this will just be a recommendation --

MR. VAN DEN BERG: Right.

MR. STEIN: -- to us. And I don't think when we are dealing with funds of that magnitude -- and this is what

I wanted to ascertain, give or take 10 or 20 percent of those funds -- if you are talking between $4 and $6 million, these are not the kind of funds that can ordinarily be committed just by the fiat of the people who participate in enforcement conferences. This is a little beyond our powers, and we will have to go through some sort of budget approval before that kind of money can be available.

Are there any other comments or questions?

MR. LYON: Yes, Mr. Chairman, I have one question, that comes from a Pennsylvania citizen, which says: Are there any citizens going to be on this committee?

Good question.

MR. VAN DEN BERG: I would think that would be accepted or rejected by the conferees, and I don't see why there shouldn't be citizens groups represented on this committee.

MR. STEIN: That was an interesting question.

As far as I know, all the representatives that we have ever had from Pennsylvania or sent from the Federal Government have always been citizens. But I think we need citizens groups.

MR. LYON: Citizens that are not involved.

MR. STEIN: Right.

MR. McKEE: Mr. Chairman.

I would take the same position on these recommendations as I did on the previous set and the technical report. I have some suggestions and modifications that I would like to make on these recommendations at the proper time.

MR. LYON: Pennsylvania is also in that particular spot, and I think later we can all talk about it.

MR. STEIN: That is correct. I think, as you can tell, most of the questions that I had at this time were clarifying and technical questions, rather than getting at the heart of that. I would ask that the conferees look at these recommendations, and if there are going to be any modifications of these, the recommendations that come up from the conference possibly should look something like this or be a variant of that. I don't even say a close variant, but something is needed.

At this point, are there any other Federal Agencies that wish to come up? If not, we will go ahead with the Pennsylvania presentation. I think what we will try to do is just hear Mr. Lyon and have comments and questions, and at that point recess for lunch. Once we see when we are going to recess, we will announce when we are going to reconvene.

Usually we take about an hour and a half or so for lunch because we have discovered that we move fastest that way. In a center city like this we can do that much faster and get the people back.

Mr. Lyon.

## STATEMENT OF WALTER A. LYON, DIRECTOR,
## BUREAU OF SANITARY ENGINEERING,
## PENNSYVANIA DEPARTMENT OF ENVIRONMENTAL RESOURCES,
## HARRISBURG, PENNSYLVANIA

MR. LYON: Mr. Chairman, our total submission is the blue-covered report that has been passed out to the conferees, and I will not read the whole report. We do have a few extra copies here for people in the audience who may not have received one, and if we run out we will be happy to send those of you who don't get a copy if you will leave a note with me. Unfortunately, Railway Express seems to have most of them at this point.

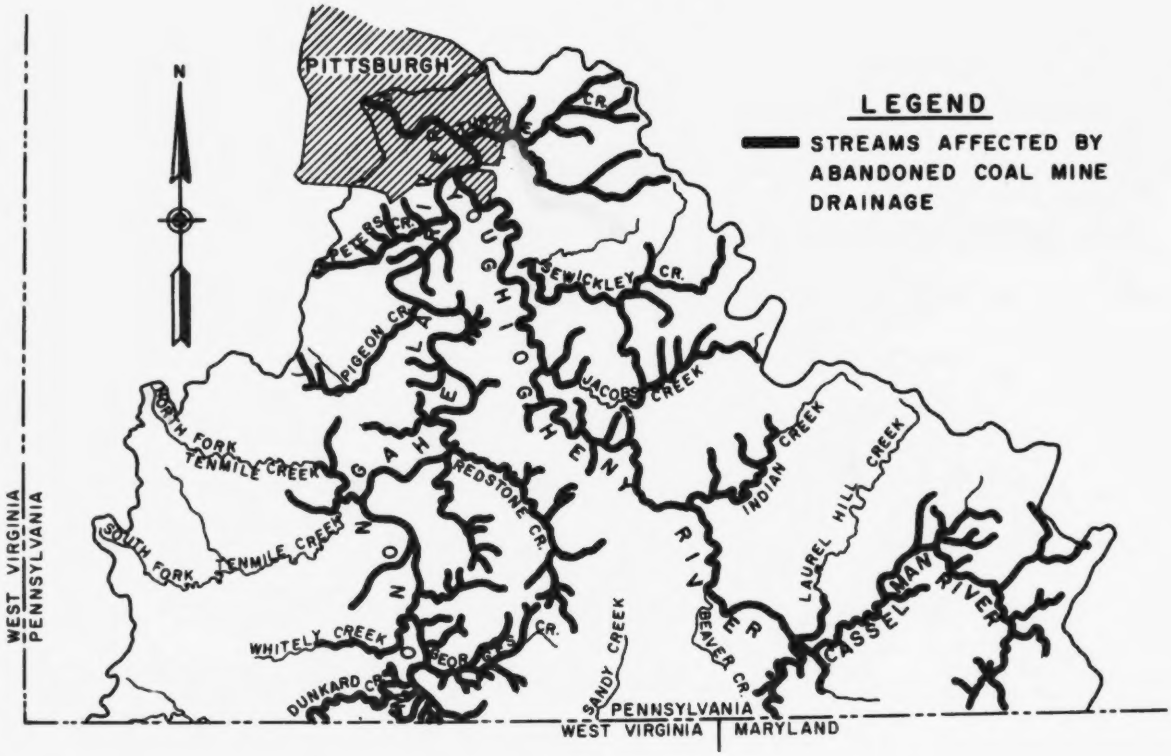
MR. STEIN: Do you want this report included in the record?

MR. LYON: Yes, in toto.

MR. STEIN: Yes. Without objection this will be included in the record as if read.

(The report above referred to follows in its entirety.)

# WATER QUALITY MANAGEMENT IN THE MONONGAHELA RIVER BASIN



A REPORT BY
PENNSYLVANIA DEPARTMENT OF
ENVIRONMENTAL RESOURCES
BUREAU OF SANITARY ENGINEERING

PUBLICATION NO. 29 AUGUST 1971

# WATER QUALITY MANAGEMENT
# IN THE
# MONONGAHELA RIVER BASIN

Pennsylvania's Official Presentation at Conference called by the Administrator, U.S. Environmental Protection Agency on Interstate Pollution of the Waters of the Monongahela River, August 24-25, 1971, Pittsburgh, Pennsylvania.

Presented by
Walter A. Lyon
Director
Bureau of Sanitary Engineering
Pennsylvania Department of Environmental Resources

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## I. INTRODUCTION

This report provides information on the current status of water quality management efforts in the Pennsylvania portion of the Monongahela River Basin and updates information presented at the 1963 Monongahela River enforcement conference called under the provisions of the Federal Water Pollution Control Act.

## II. SUMMARY AND CONCLUSIONS

The quality of the Monongahela River is improving. It is not as acid and not as oily as it used to be. Fish are present in the lower reaches, and some tributaries have been stocked with trout for the first time in memory. A considerable portion of the improvement is due to better waste treatment at mines, industries and communities.

Pollution from abandoned coal mine drainage is the most serious water pollution control problem in the Pennsylvania portion of the basin. Abatement of abandoned mine drainage pollution has lagged behind other pollution abatement. The acid condition of the streams and a depressed economic condition in the coal mining regions have discouraged pollution abatement. The active mines are now treating their wastes but many small municipalities, particularly those located on acid streams, are not, despite court orders. At this time, 60 percent of the municipalities in the state that discharge to acid streams do not treat, and many are not taking satisfactory steps to provide treatment. In contrast, on alkaline streams, 85 percent of the municipalities in the state provide treatment and most of the remaining municipalities are taking satisfactory steps toward pollution abatement. This same relationship holds for the Monongahela River Basin. The untreated municipal discharges to acid streams make up nearly 90 percent of the untreated municipal discharges in the Pennsylvania portion of the basin. Communities generally will treat their sewage if they can see an improvement of conditions. This improvement can be difficult to demonstrate in acid streams.

Without significant abandoned mine drainage pollution abatement on the Monongahela watershed, we do not expect to see a further marked improvement in the quality and usefulness of the river. The adverse effects of mine drainage will still be present, and river conditions will make it more difficult to detect the effects of other discharges.

Pennsylvania is underway in its statewide program to abate pollution from abandoned coal mining operations. One hundred fifty million dollars of the state's $500 million Land and Water Conservation and Reclamation Fund have been allocated for this purpose. This allocation represents a signigicant start in solving the problem but help is needed. Supplemental Federal funds are needed immediately to accelerate the program. Since the mine drainage pollution problem is interstate in nature, funds are needed in other states as well to aid in solving this problem. Since 1963, there have been Federal studies of the abandoned mine drainage problem but little corrective action.

The public expectation of an enforcement conference is that it will result in pollution being abated. The 1963 session of this conference recognized that the solution to the water quality problems of the Monongahela River Basin could not be achieved through enforcement alone. As a matter of fact it was recognized that enforcement would have a limited role in solving the abandoned mine drainage problem.

Pennsylvania is working to solve the water quality problems of the Monongahela River Basin. This is evidenced by:

1. 85% of the 245 sewerage cases in the basin being in compliance with standards or making satisfactory progress toward compliance.
2. The offering of approximately $5.8 million in state financial aid to construct twenty sewage treatment plants since 1968.
3. The providing of $17.5 million in state grants for the operation and maintenance of sewage treatment plants in Monongahela Basin counties since 1963.
4. 93% of the 193 industrial plants being in compliance or making satisfactory progress toward compliance.
5. 97% of the 147 active coal mines in the basin meeting state effluent standards.
6. The spending of approximately $1.5 million of state funds on 33 abandoned mine drainage pollution abatement projects.

These state efforts will continue but Federal financial participation is needed in specific abandoned mine drainage pollution projects selected on a priority basis to solve the overwhelming pollution problem of the basin.

## I. DESCRIPTION OF THE MONONGAHELA RIVER BASIN

The Monongahela River originates in northern West Virginia and is formed by the confluence of the Tygart and West Fork Rivers. The river is 128.1 miles in length. It flows through Pennsylvania in a northerly direction for 91.6 miles forming one boundary of the following Pennsylvania counties: Greene, Fayette, Westmoreland, Washington and Allegheny. At Pittsburgh in Allegheny County, it meets the Allegheny River to form the Ohio River.

The basin lies entirely in the Appalachian Plateau Region and is characterized by rugged topography with narrow stream valleys.

The drainage basin comprises a total of 7,340 square miles of which 57 percent is in West Virginia, 38 percent in Pennsylvania and 5 percent in Maryland.

Major tributaries of the Monongahela River and their drainage areas are: The West Fork River - 882 sq. mi., the Tygart River - 1,369 sq. mi., the Cheat River - 1,424 sq. mi., and the Youghiogheny River - 1,768 sq. mi.

Approximately 71 percent of the Youghiogheny River Basin lies within Pennsylvania. Only approximately 7 percent of the Cheat River drainage basin lies in Pennsylvania.

Stream flow in the basin is regulated to some extent by a network of multiple purpose dams and reservoirs in the headwaters. The major impoundments include Tygart, Lake Lynn (Cheat River), Deep Creek (tributary of the Youghiogheny River) and Youghiogheny River Reservoirs.

The U. S. Geological Survey has three gaging stations on the Monongahela River in Pennsylvania, and four gaging stations on the Youghiogheny River in Pennsylvania. The drainage areas and flows at the locations of each of these gaging stations are given on Table 1, Appendix A.

The Monongahela River Basin overlies one of the most valuable and extensively developed deposits of bituminous coal in the world. Coal mining, coking, and iron and steel manufacturing have made this district world famous. The lower Monongahela River passes through one of the most densely developed industrial areas in the nation.

## IV. PENNSYLVANIA'S WATER QUALITY MANAGEMENT PROGRAM

### A. Department of Environmental Resources

The Department of Environmental Resources administers the state water quality management program. The Department of Environmental Resources was formed on January 19, 1971.

The Environmental Quality Board establishes regulations and policy for protection and management of environmental resources including water quality. The Environmental Hearing Board will conduct administrative hearings to hear appeals related to water pollution control actions by the Department and to assess civil penalties. The Citizen Advisory Council advises the Department and the Legislature on needed legislation and program improvement.

### B. Legislation

The principal legislation used to control water pollution in Pennsylvania is the Clean Streams Law. This law was significantly amended last year to make it a comprehensive water quality management law. The law provides for control of all active waste discharges as well as the control of potential sources of pollution. Other legislation includes the Solid Waste Management Act, the Municipal Sewerage Facilities Act, and the Bituminous Strip Mine Act, all administered by the Department of Environmental Resources. Penalties for pollution are also provided in the Pennsylvania Fish Code administered by the Pennsylvania Fish Commission.

### C. Enforcement

Enforcement consists of three major activities; investigation, administrative action, and legal action.

1. Investigation includes routine monitoring and inspection, special studies, and investigation of reports of violation made by interested persons. Field work may be supplemented with mathematical analysis to help identify potential problem areas. Investigations are carried out principally by the Bureau of Sanitary Engineering and the Bureau of Land Protection and Reclamation in the Department of Environmental Resources. The state trooper assigned to the Deputy Secretary for Enforcement participates in many special investigations.

2. Administrative enforcement actions are carried out by the department and consist principally of

(a) notices to upgrade treatment,
(b) orders to cease a violation of the law or a permit, and
(c) modification, suspension or revocation of a permit.

Any of the foregoing may give rise to an administrative hearing before the department (Environmental Hearing Board when established; presently the Secretary), and judicial review of the hearing is possible. Orders to cease, and permit suspensions and revocations are referred to and coordinated with the Deputy Secretary for Enforcement.

Notices to upgrade treatment comprise a major portion of administrative enforcement actions, and are taken as the result of statewide upgrading as well as water quality standards specific to a geographical area.

Since 1963 five major statewide standards were adopted or upgraded. These are

(a) Mine drainage control
(b) Acid and iron control--Industrial Wastes
(c) Suspended solids control--Mineral preparation
(d) Secondary treatment and disinfection
(e) Heated waste control

In addition, two water quality standards hearings were held in Pittsburgh--one for interstate waters and one for intrastate waters in the area.

As a result of these actions we estimate that 750 notices to comply with new regulations have been issued on the Monongahela River basin. Approximately 100 of these 750 notices were issued during June of 1971 and schedules are not required until late in September, 1971 (90 days). Of the 650 notices issued previously we estimate that 550 are in compliance and 50 to 75 are making satisfactory progress.

3. Legal enforcement action was significantly enhanced during the past year by three major actions:

(a) Establishment of an Environmental Pollution Strike Force, presently consisting of ten attorneys who are vigorously pursuing law enforcement in the state's environmental protection program.
(b) Establishment of the Department of Environmental Resources and within the department, the position of Deputy Secretary for Enforcement.
(c) Training of department personnel in police investigation techniques and the filing of criminal complaints. The department files certain criminal complaints after consultation with the attorneys.

The major legal enforcement actions are litigation, criminal sanctions and negotiation.

Litigation is generally in the form of an equity action in which the Commonwealth requests the court to order the polluter to take those steps necessary to abate pollution and restore the environment.

Criminal sanctions are taken under the pertinent penalty sections of the Clean Streams Law, and the penalties are fines or jail sentences. Although there is no provision for abatement, the judge may order abatement under the public nuisance section of the Penal Code.

Negotiations, in the case of a violation, usually result in a "stipulation" in order to resolve a problem. A stipulation may include

(a) Requirement for immediate construction of treatment facilities
(b) A completion date for facilities
(c) A per diem charge if deadlines are not met
(d) A bond or escrow account to assure payment
(e) A commitment to restore ecological damage
(f) A plan for immediate reduction of wastes, such as temporary treatment
(g) A monthly penalty payment to the Commonwealth during the period of construction
(h) A monthly payment to the Commonwealth equal to the estimated amount that the pollutor saves by not treating during the construction period
(i) A payment of civil penalties

In addition to traditional administrative and legal enforcement procedures, the 1970 amendments to the Clean Streams Law provides for assessment of civil penalties, after a hearing, in the case of violations.

All penalties collected under the Clean Streams Law enforcement program are paid into the "Clean Water Fund" which is administered for the elimination of pollution. Since created by the 1970 Clean Streams Law amendments, $160,000 in penalties have been paid into the fund.

During the past year, 18 various legal enforcement actions have been taken in the Monongahela River Basin.

## D. Sewerage Program

The Department of Environmental Resources, under provisions of the Clean Streams Law has the duty and responsibility to assure that all sewage discharged into the waters of the Commonwealth receives adequate treatment to meet water quality standards and protect stream uses. As a matter of common decency, a minimum of secondary treatment is required for discharge to all streams except those which are acid impregnated. A minimum of primary treatment is required prior to discharge to acid impregnated streams. In many cases, treatment higher than minimum secondary has been required to protect stream uses.

Action against inadequately treated or unauthorized discharges is taken in the form of an order or notice of change of treatment requirements which require the submission of a time schedule of steps to be taken to abate the discharge or provide adequate treatment within a reasonable time period. Failure to comply with orders or notices in most cases results in further enforcement action. The Department's authority to direct compliance with provisions of the Clean Streams Law has been affirmed by the courts in a number of instances.

In addition to requiring the abatement or correction of untreated or inadequately treated discharges, the Department now has the authority to require a municipality to acquire, construct, repair, alter, complete, extend or operate a sanitary sewer system or treatment plant where it has been determined that such action is needed to prevent or eliminate pollution or public health nuisances. This authority was granted to the Department in amendments to the Clean Streams Law adopted in July, 1970. This provision of the law allows the Department to achieve correction of sewage disposal and sewer service needs more efficiently and directly than taking separate action against numerous individual dischargers in a developed area.

The 1970 amendments to the Clean Streams Law and the promulgation of new Federal Grant Regulations (18CFR601) establish a clear responsibility for the development of comprehensive wastewater management systems which consider the feasibility of combined or joint treatment facilities, the immediate and long-range economic impact of a project upon the Commonwealth and its citizens, and the need for wastewater treatment in the watershed as a whole. During the period of development of comprehensive wastewater management plans throughout the Commonwealth, the Department is reviewing projects considering the best mix of (1) expeditious action to abate pollution and public health nuisances, (2) consistency with available information on a long-range wastewater management, and (3) economy.

## E. Industrial Wastes Program

The Clean Streams Law prohibits the discharge of industrial wastes unless a permit for the discharge has been issued by the Department of Environmental Resources. The Department will not approve discharges that will cause pollution or violate water quality criteria.

The 1970 amendments to the Clean Streams Law allows the Department not only to control industrial waste discharges but also to take action to prevent potential pollution. A Pollution Incident Prevention Plan program was initiated in 1969 for all permit applicants, and orders to prepare a plan were issued to high risk permit holders.

This program requires the establishment of a positive program by an industrial operation for the prevention of accidental discharges of polluting materials and considers plant operations, operating procedures, the effects of breakdown of treatment plant equipment, maintenance and inspection, a personnel training program, communications and chain of command for reporting, effects of power failure, procedure for notification of pollution incidents, and clean-up services and equipment.

Pollution incident prevention is of highest priority in a proposed industrial waste program expansion. At present, high risk installations such as waste "lagoons" are being investigated by available personnel, and actions to have corrections made are being taken on a priority basis. Considerable staff expansion or time will be needed to get to the thousands of bulk oil and other bulk storage areas that present a pollution hazard.

Enforcement of the industrial waste program was generally described in part C of this section.

## F. Mine Drainage Program

Pennsylvania's program to regulate mining activities began in 1945. The amendments to the Clean Streams Law in that year prohibited the discharge of acid mine drainage to unpolluted streams. Exempted from its provisions were discharges to already polluted streams. In 1965 the Clean Streams Law was further amended to remove the 1945 exemptions and prohibit the discharge of polluting mine waters to all Pennsylvania streams.

The 1970 amendments broadened regulatory control over all mineral extraction operations, provided for control over potential pollution, and strengthened the penalty provisions. The amendments also allow the Department to require mine operators to post bonds with the Commonwealth to insure that there will be compliance with the law.

Within Pennsylvania's portion of the Monongahela River Basin there are 71 active deep mines. Thirty-nine have discharges that meet established water quality standards and 28 have no discharge. There are 23 treatment plants in operation. There are 76 active strip mines in the Monongahela Basin, while 93 more have received permits for operation. All the active mines have facilities available to treat unsatisfactory discharges. A list of these mines is included in Appendices C and D which also provide a summary of the operation status as of August 1, 1971.

### Control of Pollution from Active and Proposed Mining Operations

### Submission of Mining Plans or Plans of Drainage

Prior to the commencement of any mining operation, the operator must first obtain a permit from the Department of Environmental Resources for operation of the mine and, where appropriate, for the discharge of mine drainage to waters of the Commonwalth. An application for such a permit must include plans and engineering data which indicate the manner in which pollution will be prevented during and after the operation of the mine.

Deep mine applications must include geologic structure maps showing the manner in which the mine will be developed. The development plans must include the maintenance of adequate barriers along outcrops and property lines as well as between the proposed workings and adjacent mines. The mine development plans must also include all other relevant hydrogeologic data which would be pertinent in determining the probability of whether the mine can be successfully sealed to prevent pollution upon completion of mining.

If a mine drainage discharge is anticipated that will not meet the Department's discharge standards, then the application must include plans for the treatment of the mine drainage. The quality of water permitted to be discharged must have a pH between 6 and 9, contain no acid, and a total iron concentration of 7 mg/l or less. If special conditions warrant, more stringent discharge requirements or other modifications may be required. Where stream standards are established, the discharge must be compatible with them.

Open pit or strip mine applications must be supported by plans showing the manner in which any drainage from the mine will be treated to meet the Department's discharge requirements. The application sets forth the manner in which the mine will be operated to eliminate pollution and how it will be restored to prevent pollution after completion of mining. Before any person operates a bituminous open pit mine, he must first be licensed as an open pit mining operator by the Department of Environmental Resources and must receive a permit for each separate operation. The application for such permits include detailed plans showing the manner, time and distance of backfilling. Either terrace or contour restoration is required, depending on the slope of the original ground. The restoration plan must include the manner in which the operator shall plant trees, shrubs, or grasses upon the land affected by the open pit mine.

### Issuance of Permits

A permit is required prior to operation of the mine or construction of treatment facilities. Treatment facilities must be constructed prior to operation of the mine unless the operator can show that water pollution is not likely to occur immediately. In such an event, the operator may submit a construction schedule coordinated with the time he expects pollution to occur.

If the proposed plans of drainage are satisfactory to the Department, permits will be issued. One major consideration in determining whether a permit shall be issued is an evaluation of the operator's previous violation history. If the Department feels that past performance indicates an operator may not follow his plan of drainage, the permit may be refused.

### Field Inspections

All of the active mines under permit are inspected by the agents of the Department of Environmental Resources. The frequency of inspections varies with the operation history of the mine. Those mines with a history of violation are inspected more frequently than those in compliance.

## G. Control of Pollution From Abandoned Mines - Pennsylvania's Program

Pennsylvania's program for the abatement of pollution from abandoned mines consists of four phases and is well underway.

Phase I Pollution Source Inventory

Field crews locate and map the sources of pollution from abandoned mines. The drainage is measured, sampled, and analyzed in preparation for Phase II-A.

Phase II Engineering Studies and Plans

A. On a priority basis undertake preliminary feasibility studies propose methods to abate the polluting sources and estimate the cost of the projects. Sampling and flow measurements are made over a 12-month period to determine variations in quality and quantity of pollutants.

B. Based on Phase II-A studies, detailed engineering plans are made and final cost estimates are prepared relative to the most applicable Phase II-A proposal.

Phase III Construction

This would include construction of the least-cost combination of all or one of the following:

A. Sealing of deep mines

B. Burial of exposed acid-forming refuse

C. Backfilling pre-Act strip pits

D. Correction of defective backfills

E. Diversion of streams and rainfall runoff seeping into strip and deep mines

F. Regulation of stream flows (flow augmentation)

G. Treatment

Phase IV Operation and Maintenance

The reclamation and abatement facilities, such as treatment plants, mine seals, and stream flow regulation dams, must be operated and maintained.

## Abandoned Mine Inventories

The majority of the coal mining areas in Pennsylvania have been inventoried to determine the number and magnitude of discharges from abandoned mines. The preliminary work in the Monongahela River Basin was undertaken by the U. S. Environmental Protection Agency as a result of the 1963 Monongahela River Enforcement Conference recommendations.

## Funds Devoted to the Problem

In 1967 Pennsylvania's voters approved a $500 million land and water conservation and reclamation bond issue of which $150 million will be devoted to abandoned mine drainage pollution abatement over a ten-year period.

### Program Needs

Pollution abatement, rather than more studies and surveys, is needed to abate abandoned mine drainage pollution in the Monongahela River Basin. To the maximum possible extent, the pollution source inventory data (Phase I) collected by the Environmental Protection Agency should be used to establish priorities for the abatement of abandoned mine drainage pollution. Priorities should be determined on the basis of getting the maximum amount of water quality improvement per dollar spent. In order to expedite the implementation of the priority projects Federal financial help is needed.

## H. Water Quality Standards Program

Water quality standards have been adopted for the interstate waters of the Monongahela Basin and for intrastate waters of the Monongahela Basin lying generally upstream from the Westmoreland and Fayette County line. Standards for the remainder of the basin are presently under preparation.

The water quality standards call for protection of all existing and potential water uses for these waters. Uses include all the existing and potential withdrawal uses as well as in-stream uses such as fishing and recreation.

Implementation Plans have been prepared for the areas where water quality standards have been adopted. These implementation plans designate specific actions which must be taken by each discharger in order to abate pollution and restore the stream to the standards of quality. In many areas of the basin, these actions will not restore the stream to required quality because of the presence of abandoned mine drainage.

## I. ORSANCO

Pennsylvania is a member of the Ohio River Valley Water Sanitation Commission and its actions and standards are compatible with the ORSANCO standards for sewage and industrial waste mine drainage treatment in the basin.

A review of the existing ORSANCO standards for this basin indicate that the Pennsylvania standards are higher than ORSANCO standards.

## V. PENNSYLVANIA'S USE OF THE RIVER

The Monongahela River is heavily used in Pennsylvania for municipal and industrial water supply and for navigation. Recreational use is beginning to increase as the quality of the river improves. A program for river front improvement in the Pittsburgh area has been initiated by a local development group and this program is highly dependent on improved water quality in the Monongahela River.

Public water supplies on the basin use over 100 million gallons per day of water. Intakes in Pennsylvania use water from main stem of the river practically from the West Virginia-Pennsylvania state line to the mouth. Several water purveyors using the Monongahela River have been unable to meet the USPHS Drinking Water Requirements due to high concentrations of sulphate and dissolved solids in the river. This problem is believed to be caused principally by abandoned mine drainage.

Industries use an estimated 1.2 billion gallons per day from the Monongahela River Basin. The greatest industrial use of these waters is for cooling purposes. Power plants and steel mills are the principal water users.

The acid condition of the river adversely affects industrial and municipal water supply use because of accelerated corrosion problems. Excessive hardness, iron and manganese concentrations, as well as the high total dissolved solids contributed by mine drainage are undesireable. These conditions increase the cost of using Monongahela River waters.

Because of the acid condition of the river, many users must neutralize the river water before use. This neutralization by water users has helped add some alkalinity to the river and is responsible for some of the progressive downstream improvement.

## VI. POLLUTION CONTROL STATUS IN THE BASIN.

This chapter presents a brief summary of the pollution control status in the Monongahela Basin. A detailed status is presented in Appendices A through F. There is no major attempt to compare the pollution control status of 1971 with that of 1963. There have been many changes in regulations and treatment requirements during this period and these changes prevent a common base for comparison.

### A. Sewerage

All municipal, and those non-municipal sewerage cases that are not in compliance and are located in the Monongahela Basin are listed in Appendix B. A total of 117 municipal and 11 non-municipal cases are listed. In addition there are a total of 118 non-municipal sewerage cases in compliance that are not listed.

The Appendix provides information on the status of facilities, compliance with water quality standards, and in cases where standards are not being complied with a brief summary of enforcement actions taken or pending.

The following is a summary of sewerage case status in the basin:

| | Number | % of Total |
|---|---|---|
| Total Cases | 245 | |
| Cases Providing Treatment | 204 | 83.3 |
| Cases Meeting Water Quality Standards (Compliance) | 180 | 73.5 |
| Cases making satisfactory progress toward meeting standards | 28 | 11.4 |
| Cases not making satisfactory progress | 37 | 15.1 |

Under the provisions of Act 537, the Pennsylvania Sewage Facilities Act, the Department of Environmental Resources is sponsoring the preparation of county and municipal sewer service plans. 50% matching grants are made by the Commonwealth toward plan development.

The following is the status of county plan preparation in the Monongahela Basin:

| County | Status |
|---|---|
| Allegheny | Completed Plan under review |
| Washington | Completed Plan under review |
| Westmoreland | Completed Plan under review |
| Greene | Plan under Development |
| Fayette | Plan under Development |
| Somerset | Completed Plan approved |

In addition, a total of 46 municipal studies, related to the County Sewage Plans have been completed, with departmental financial assistance.

## B. Industrial Wastes

Appendix A includes the name and location of the industrial establishments discharging wastes directly to the Monongahela River Basin in Pennsylvania. The tables indicate the location of the industry, whether or not treatment is being provided, whether treatment meets required standards, any enforcement action, and status of the project. The tables indicate the status as of July 31, 1971.

"Project Status" lists the step that has been reached in the abatement or construction schedule.

At the present time, there are 193 industrial plants discharging wastes to the Monongahela Basin in Pennsylvania. One hundred fifty-eight (81.8%) are providing adequate treatment. The remaining cases are either proceeding toward satisfactory treatment (11.9%) or are being subjected to enforcement action (6.3%).

## C. Mine Drainage

Of the 147 active bituminous mine cases operating in the Basin, listed in Appendices C and D, four are in violation. Of all the active mines on this watershed, 97.2% meet discharge standards. Projects to abate pollution from abandoned mines are reported in Section VII - C of this report.

Table 8 of the 1963 edition of this report listed 10 deep mines in the Basin that were discharging over 300 tons of acid per year. Five of the mines are now closed but they once contributed 22,530 tons of acid per year. The remaining five mines are still active however their discharges are treated and meet Department discharge standards. They once accounted for 17,510 tons of acid per year.

Since 1968 the Commonwealth has been undertaking detailed studies on watersheds where serious abandoned mine drainage problems were known to exist. These studies involve four-season sampling so that hydrologic effects on pollution can be determined.

Since 1965, the Commonwealth has expended $1,430,792.73 on thirty-three mine drainage abatement projects in the Monongahela Basin. Twenty-seven of these projects were financed by general appropriations in the amount of $84,407.75. These projects are listed in Appendix F. The six remaining projects, amounting to $1,346,384.98, were funded through the $500 Million Bond issue. These projects are listed in Appendix E. The projects reflect all four phases of Pennsylvania's Abandoned Mine Drainage Pollution Abatement Plan. As more of the $500 Million Bond Issue Funds become available, additional abatement projects on the Monongahela Basin will be evaluated.

A comprehensive abandoned mine drainage pollution abatement study of the entire Youghiogheny River Basin is programmed for completion early in September, 1971. This study will set forth specific abatement projects and their costs for the Pennsylvania Portion of this major tributary of the Monongahela River.

## VII. WATER QUALITY

The major source of water pollution on the Monongahela Basin is mine drainage from abandoned coal mines. There are other obvious pollution problems and many more would become noticeable if the mine drainage discharges were suddenly stopped. If mine drainage pollution were suddenly stopped, the Monongahela River would support fish life from the state line to the mouth, and most tributaries would also support fish life. When mine drainage was reduced on the headwaters of Peters Creek, fish returned in the Finleyville area despite raw sewage discharges. West Pike Run was relieved of its acid burden and stocked with trout. Miles of the Youghiogheny River will become trout water when abandoned mine drainage projects on the watershed being undertaken by the state are completed. Both Fayette and Westmoreland Counties are planning to use the Youghiogheny for water supply.

If mine drainage pollution were abated, communities would try harder to treat their sewage because sludge banks, gray water and bacteria would impair the uses of the river. Industries would operate more carefully because a fish kill could result from illegal dumping.

In certain areas, tertiary treatment of sewage and industrial wastes will be needed to maintain water quality after mine drainage abatement occurs. This is particularly the case in portions of Allegheny and Westmoreland Counties where streams are small and population is growing. In anticipation of these needs, the Department, two months ago, required an upgrading of treatment requirements in these areas.

A comparison of water quality conditions in the Monongahela and Youghiogheny Rivers for the years 1963 and 1970 shows that the pH and alkalinity have improved significantly at Charleroi and Braddock on the Monongahela River and at Sutersville and Connellsville on the Youghiogheny River. There was no apparent change at Greensboro on the Monongahela River and slight improvement at the Youghiogheny River Dam. Hardness, sulfate, and dissolved solids concentrations at these locations have increased, although this may be due principally to lower stream flows during 1970. It does not appear that the loadings of these substances have significantly changed.

There has been no significant improvement in the phenol problem on the Monongahela River.

## TABLE 1
## STREAM FLOW DATA

### MONONGAHELA RIVER GAGING STATIONS

| Gaging Station | Drainage Area (Sq. Mi.) | Years of Record | Avg. | Discharges Max. | (cfs) Min. |
|---|---|---|---|---|---|
| Greensboro, Pa. | 4407 | 32 | 7,878 | 134,000 | 204 |
| Charleroi, Pa. | 5213 | 37 | 8,758 | 158,000 | 302 |
| Braddock, Pa. | 7337 | 32 | 11,950 | 201,000 | 559 |

### YOUGHIOGHENY RIVER GAGING STATIONS

| | | | | | |
|---|---|---|---|---|---|
| Youghiogheny River Dam | 436 | 31 | 828 | 13,700 | --- |
| Confluence, Pa. | 1029 | 30 | 1,892 | 69,500 | 40 |
| Connellsville, Pa. | 1326 | 62 | 2,492 | 103,000 | 11 |
| Sutersville, Pa. | 1715 | 50 | 2,909 | 108,000 | 57 |

## INDUSTRIAL WASTE STATUS
## MONONGAHELA RIVER BASIN

| County<br>ALLEGHENY<br>Name and Location | Treatment Provided | Does Treatment Meet Standards? | Enforcement Action Status | Project Status | | | |
|---|---|---|---|---|---|---|---|
| | | | | Schedule | Final Plans | Under Construction | Plant in Operation or Discharge Abated |
| **PITTSBURGH** | | | | | | | |
| Jones & Laughlin Steel North Side | Yes | Yes | | | | X | |
| Jones & Laughlin Steel South Side | Yes | Yes | | | | | X |
| J K Davidson | Yes | Yes | | | | | X |
| E Carson Packing | Yes | Yes | Tied into municipal sewer system | | | | X |
| J & L Graham Lab | Yes | Yes | | | | | X |
| B & O Railroad-Hazelwood | Yes | No | Unsatisfactory Progress - Civil penalty action bein initiated | | X | | |
| Jones & Laughlin By Products | Yes | Yes | | | X | | |
| American Oil Co. | Yes | Yes | | | | | X |
| **PENN HILLS TWP.** | | | | | | | |
| U.S. Steel Research | Yes | Yes | | | | | X |
| **MCKEESPORT** | | | | | | | |
| Firth Sterling | Yes | Yes | | | | | X |
| Fort Pitt Steel | Yes | Yes | | | | | X |

## INDUSTRIAL WASTE STATUS
## MONONGAHELA RIVER BASIN

| County<br>ALLEGHENY<br>Name and Location | Treatment Provided | Does Treatment Meet Standards? | Enforcement Action Status | Project Status | | | |
|---|---|---|---|---|---|---|---|
| | | | | Schedule | Final Plans | Under Construction | Plant in Operation or Discharge Abated |
| National Tube Cristy | Yes | Yes | | | | | X |
| National Tube Works | Yes | Yes | | | | | X |
| **WEST MIFFLIN BORO** | | | | | | | |
| U.S. Steel Irvin | Yes | No | Unsatisfactory Progress - Dept. hearing scheduled | | | | |
| Duquesne Slag | Yes | No | Under Consideration (too slow) | | | | |
| Westinghouse | Yes | Yes | | | | | X |
| Trumbul Construction | Yes | Yes | | | | | X |
| Linde Carbon | Yes | Yes | | | | | X |
| U.S. Steel - Taylor Dump | No | No discharge | Have stipulated with Dept. that Co. has temporarily corrected situation and will remain in compliance until permanent abatement measures are taken | | | | |
| **BRADDOCK BORO** | | | | | | | |
| American Chain & Cable Co. | Yes | Yes | | | | | X |
| **CLAIRTON** | | | | | | | |
| Pa. Industrial Chemical | Yes | Yes | | | | | X |

# INDUSTRIAL WASTE STATUS
# MONONGAHELA RIVER BASIN

| County<br>ALLEGHENY<br>Name and Location | Treatment Provided | Does Treatment Meet Standards? | Enforcement Action Status | Project Status: Schedule | Final Plans | Under Construction | Plant in Operation or Discharge Abated |
|---|---|---|---|---|---|---|---|
| U.S. Steel Clairton Works | Yes | Yes | | | | | X |
| U.S. Steel By Product Plant | No | No | Unsatisfactory Progress. Civil penalties complaint filed - hearing to be scheduled | | | | |
| DUQUESNE | | | | | | | |
| U.S. Steel Corporation | Yes | Yes | | | | | X |
| MONROEVILLE BORO | | | | | | | |
| Union Railroad | No | Yes | New case. Civil penalty and criminal action to be taken progress unsatisfactory | | | | |
| Eremics Provision | Yes | Yes | | | | | X |
| Pa. Railroad Co. | Yes | Yes | | | | | X |
| Chambers Reduction Co. | No | No | Unsatisfactory Progress - Court decree has been issued. Has submitted application for permit | | | | |

# INDUSTRIAL WASTE STATUS
# MONONGAHELA RIVER BASIN

| County<br>ALLEGHENY<br>Name and Location | Treatment Provided | Does Treatment Meet Standards? | Enforcement Action Status | Project Status | | | |
|---|---|---|---|---|---|---|---|
| | | | | Schedule | Final Plans | Under Construction | Plant in Operation or Discharge Abated |
| **NORTH BRADDOCK BORO** | | | | | | | |
| U.S. Steel Thompson Works | Yes | No | Unsatisfactory Progress - Criminal action pending | | | | |
| **DRAVOSBURG BORO** | | | | | | | |
| Gateway Asphalt | Yes | Yes | | | | | X |
| Boswell Oil Co. | Yes | Yes | | | | | X |
| **EAST PITTSBURGH BORO** | | | | | | | |
| Westinghouse | Yes | No | Satisfactory Progress - upgrade order 11-10-70 | | | | |
| **FOREST HILLS BORO** | | | | | | | |
| Westinghouse | Yes | Yes | | | | | X |
| **GLASSPORT BORO** | | | | | | | |
| Copperweld Steel | Yes | No | Satisfactory Progress - should be in compliance by November 1971 | | X | | |

## INDUSTRIAL WASTE STATUS
## MONONGAHELA RIVER BASIN

| County<br><br>**ALLEGHENY**<br><br>Name and Location | Treatment Provided | Does Treatment Meet Standards? | Enforcement Action Status | Project Status: Schedule | Final Plans | Under Construction | Plant in Operation or Discharge Abated |
|---|---|---|---|---|---|---|---|
| Pittron | Yes | Yes | | | | | X |
| Southwest Steel | Yes | Yes | | | | | X |
| HOMESTEAD BORO | | | | | | | |
| U.S. Steel Homestead Works | Yes | No | Unsatisfactory Progress - Civil penalty hearing in August 1971 by Department | | | | |
| JEFFERSON BORO | | | | | | | |
| Mississippi Glass Co. | Yes | Yes | | | | | X |
| Pa. Industrial Chemical | Yes | No | Satisfactory Progress - criminal and civil penalty initiated by Region $300 and $1600 - July 70 and 71 | | X | | |
| Westinghouse Astro | Yes | Yes | | | | | X |
| Ashland Oil Co. | Yes | Yes | One spill. Criminal action - $250 fine - August 1970 | | | | X |

# INDUSTRIAL WASTE STATUS
# MONONGAHELA RIVER BASIN

| County<br>ALLEGHENY<br>Name and Location | Treatment Provided | Does Treatment Meet Standards? | Enforcement Action Status | Project Status: Schedule | Project Status: Final Plans | Project Status: Under Construction | Project Status: Plant in Operation or Discharge Abated |
|---|---|---|---|---|---|---|---|
| Cochran Western | Yes | Yes | | | | | X |
| RANKIN BORO | | | | | | | |
| Acheson Manufacturing Co. | Yes | Yes | | | | | X |
| WEST HOMESTEAD BORO | | | | | | | |
| Mesta Machine | Yes | Yes | | | | | X |
| WILKINS TWP. | | | | | | | |
| Westinghouse Newtown | Yes | Yes | | | | | X |
| WILMERDING BORO | | | | | | | |
| Westinghouse Air Brake | No | No | Satisfactory Progress - Have entered Allegheny County Sanitary System. Awaiting investigation | | | | X |
| SNOWDEN TWP. | | | | | | | |
| Consolidated Coal R&D | Yes | Yes | | | | | X |

## INDUSTRIAL WASTE STATUS
## MONONGAHELA RIVER BASIN

| County<br>FAYETTE<br>Name and Location | Treatment Provided | Does Treatment Meet Standards? | Enforcement Action Status | Project Status | | | |
|---|---|---|---|---|---|---|---|
| | | | | Schedule | Final Plans | Under Construction | Plant in Operation or Discharge Abated |
| CONNELLSVILLE | | | | | | | |
| Consolidated Steel | Yes | Yes | | | | | X |
| SOUTH CONNELLSVILLE | | | | | | | |
| Anchor Hocking Glass | Yes | Yes | | | | | X |
| BULLSKIN TWP. | | | | | | | |
| Commer St. | Yes | Yes | | | | | X |
| CONNELLSVILLE TWP. | | | | | | | |
| Consolidated Steel | Yes | Yes | | | | | X |
| DUNBAR TWP. | | | | | | | |
| Koppers Co. | Yes | Yes | | | | | X |
| Interstate Amiesite | Yes | Yes | | | | | X |
| Joseph Packing | Yes | Yes | | | | | X |
| Paul Kendi Sons | Yes | Yes | | | | | X |
| West Maryland RR | Yes | Yes | | | | | X |
| Hi-Lo Clay Co. | Yes | Yes | | | | | X |

## INDUSTRIAL WASTE STATUS
## MONONGAHELA RIVER BASIN

| County<br>FAYETTE<br>Name and Location | Treatment Provided | Does Treatment Meet Standards? | Enforcement Action Status | Project Status: Schedule | Project Status: Final Plans | Project Status: Under Construction | Project Status: Plant in Operation or Discharge Abated |
|---|---|---|---|---|---|---|---|
| **FRANKLIN TWP.** | | | | | | | |
| Best Food Products | Yes | Yes | | | | | X |
| **GEORGES TWP.** | | | | | | | |
| Ruane Coal & Coke | Yes | Yes | | | | | X |
| Dankos Car Wash | Yes | Yes | | | | | X |
| Laurel Stone | Yes | Yes | | | | | X |
| **GERMAN TWP.** | | | | | | | |
| Mt. Sterling Fuel | Yes | Yes | | | | | X |
| **LUZERNE TWP.** | | | | | | | |
| Jones and Laughlin Vesta Washery | Yes | Yes | | | | | X |
| National Isabella Washery | Yes | Yes | | | | | X |
| Hillman Coal & Coke | Yes | Yes | | | | | X |

## INDUSTRIAL WASTE STATUS
## MONONGAHELA RIVER BASIN

| County<br>FAYETTE<br>Name and Location | Treatment Provided | Does Treatment Meet Standards? | Enforcement Action Status | Project Status: Schedule | Project Status: Final Plans | Project Status: Under Construction | Project Status: Plant in Operation or Discharge Abated |
|---|---|---|---|---|---|---|---|
| **MENALLAN TWP.** | | | | | | | |
| J. Pepson Tallow | Yes | Yes | | | | | X |
| Ashland Oil Co. | No | No | Unsatisfactory Progress - criminal action pending | | | | |
| **NEWELL BORO** | | | | | | | |
| Allied Chemical | Yes | No | Satisfactory Progress - criminal action fined $300. Facilities must be improved. | | | | |
| **NICHOLSON TWP.** | | | | | | | |
| Bridgeview Coal | Yes | Yes | | | | | X |
| **NORTH UNION TWP.** | | | | | | | |
| Malsbary Manufacturing | Yes | Yes | | | | | X |
| Marsolino Construction | Yes | Yes | | | | | X |
| Marsolino Cool Springs | Yes | Yes | | | | | X |
| Appalachian Stone | Yes | Yes | | | | | X |
| Pa. Mining Co. | Yes | Yes | | | | | X |

## INDUSTRIAL WASTE STATUS
## MONONGAHELA RIVER BASIN

| County<br>FAYETTE<br>Name and Location | Treatment Provided | Does Treatment Meet Standards? | Enforcement Action Status | Project Status: Schedule | Project Status: Final Plans | Project Status: Under Construction | Project Status: Plant in Operation or Discharge Abated |
|---|---|---|---|---|---|---|---|
| OHIOPYLE BORO | | | | | | | |
| Ohiopyle Water Works | Yes | Yes | | | | | X |
| SPRINGFIELD TWP. | | | | | | | |
| Eidemiller Dredging | Yes | Yes | | | | | X |
| STEWART TWP. | | | | | | | |
| Harbnwalker Refractories | Yes | Yes | | | | | X |

## INDUSTRIAL WASTE STATUS
## MONONGAHELA RIVER BASIN

| County<br>GREENE<br>Name and Location | Treatment Provided | Does Treatment Meet Standards? | Enforcement Action Status | Project Status |  |  |  |
|---|---|---|---|---|---|---|---|
|  |  |  |  | Schedule | Final Plans | Under Construction | Plant in Operation or Discharge Abated |
| CHARMICHAELS BORO |  |  |  |  |  |  |  |
| Russel Car Wash | Yes | Yes |  |  |  |  | X |
| CENTER TWP. |  |  |  |  |  |  |  |
| Equitable Gas | Yes | Yes |  |  |  |  | X |
| CLARKSVILLE BORO |  |  |  |  |  |  |  |
| Tri State Bumper | Yes | Yes |  |  |  |  | X |
| CUMBERLAND TWP. |  |  |  |  |  |  |  |
| Buckeye Coal Co. | Yes | Yes |  |  |  |  | X |
| GREENSBORO BORO |  |  |  |  |  |  |  |
| Dequesne Light Washery | Yes | Yes |  |  |  |  | X |
| JEFFERSON TWP. |  |  |  |  |  |  |  |
| Gateway Coal Co. | Yes | Yes |  |  |  |  | X |
| MONONGAHELA TWP. |  |  |  |  |  |  |  |
| Robena Coal - U.S. Steel | Yes | Yes |  |  |  |  | X |

## INDUSTRIAL WASTE STATUS
## MONONGAHELA RIVER BASIN

| County<br>GREENE<br>Name and Location | Treatment Provided | Does Treatment Meet Standards? | Enforcement Action Status | Project Status: Schedule | Project Status: Final Plans | Project Status: Under Construction | Project Status: Plant in Operation or Discharge Abated |
|---|---|---|---|---|---|---|---|
| Jones & Laughlin Steel Corporation | Yes | Yes | | | | | X |
| West Penn Power | Yes | Yes | | | | | X |
| Duquesne Light Washery | Yes | Yes | | | | | X |
| WAYNE TWP. | | | | | | | |
| Accurate Brass | Yes | Yes | | | | | X |

## INDUSTRIAL WASTE STATUS
## MONONGAHELA RIVER BASIN

| County<br>WASHINGTON<br>Name and Location | Treatment Provided | Does Treatment Meet Standards? | Enforcement Action Status | Project Status | | | |
|---|---|---|---|---|---|---|---|
| | | | | Schedule | Final Plans | Under Construction | Plant in Operation or Discharge Abated |
| **DONORA BORO** | | | | | | | |
| Hercules Inc. | Yes | Yes | | | | | X |
| **BENTLEYVILLE BORO** | | | | | | | |
| Hillcrest Dairy | Yes | Yes | | | | | X |
| **CALIFORNIA BORO** | | | | | | | |
| J. Cajan Slaughterhouse | Yes | Yes | | | | | X |
| Grandview Dairy | Yes | Yes | | | | | X |
| **CHARLEROI BORO** | | | | | | | |
| Corning Glass | Yes | Yes | | | | | X |
| **NEW EAGLE BORO** | | | | | | | |
| Greif Brothers Corp. | Yes | Yes | | | | | X |
| **ALLENPORT BORO** | | | | | | | |
| Pittsburgh Steel | Yes | Yes | | | | | X |
| **CARROLL TWP.** | | | | | | | |
| Putnak Packing Co. | Yes | Yes | | | | | X |
| Stauffer Chemical Co. | Yes | Yes | | | | | X |

## INDUSTRIAL WASTE STATUS
## MONONGAHELA RIVER BASIN

| County<br>WASHINGTON<br>Name and Location | Treatment Provided | Does Treatment Meet Standards? | Enforcement Action Status | Project Status | | | |
|---|---|---|---|---|---|---|---|
| | | | | Schedule | Final Plans | Under Construction | Plant in Operation or Discharge Abated |
| **EAST BETHLEHEM TWP.** | | | | | | | |
| Jones & Laughlin Steel Corporation | Yes | Yes | | | | | X |
| Republic Steel Clyds | Yes | Yes | | | | | X |
| **ELLSWORTH BORO** | | | | | | | |
| Mines Corporation Bethlehem | Yes | Yes | | | | | X |
| **FALLOWFIELD TWP.** | | | | | | | |
| Home Dairy Products | Yes | Yes | | | | | X |
| Locust Grove Dairy | Yes | Yes | | | | | X |
| **MARIANNA BORO** | | | | | | | |
| Bethlehem Mines | Yes | Yes | | | | | X |
| **NOTTINGHAM TWP.** | | | | | | | |
| U.S. Steel Maple Coal | Yes | Yes | | | | | X |
| **SOMERSET TWP.** | | | | | | | |
| Somerset Packing Co. | Yes | Yes | | | | | X |

## INDUSTRIAL WASTE STATUS
## MONONGAHELA RIVER BASIN

| County<br>WASHINGTON<br>Name and Location | Treatment Provided | Does Treatment Meet Standards? | Enforcement Action Status | Project Status | | | |
|---|---|---|---|---|---|---|---|
| | | | | Schedule | Final Plans | Under Construction | Plant in Operation or Discharge Abated |
| Marchezak Dairy | Yes | Yes | | | | | X |
| Bethlehem Mines | Yes | Yes | | | | | X |
| Fava Dairy | Yes | Yes | | | | | X |
| UNION TWP. | | | | | | | |
| Duquesne Light | Yes | Yes | | | | | X |
| Pittsburgh Consolidated Coal Company | Yes | Yes | | | | | X |
| West Penn Power | Yes | Yes | | | | | X |
| Penna RR Shireoaks | Yes | Yes | | | | | X |
| WEST BROWNSVILLE BORO | | | | | | | |
| Italian Maid Pizza | Yes | Yes | | | | | X |
| WEST PIKE RUN TWP. | | | | | | | |
| C. Robinson Dairy | Yes | Yes | | | | | X |
| Tri-River Fur Co. | Yes | Yes | | | | | X |
| Perry Packing Co. | Yes | No | Unsatisfactory Progress - summary action to be taken. | | | | |

## INDUSTRIAL WASTES STATUS
## MONONGAHELA RIVER BASIN

| County<br>WESTMORELAND<br>Name and Location | Treatment Provided | Does Treatment Meet Standards? | Enforcement Action Status | Project Status | | | |
|---|---|---|---|---|---|---|---|
| | | | | Schedule | Final Plans | Under Construction | Plant in Operation or Discharge Abated |
| HEMPFIELD TWP. | | | | | | | |
| Alfery Sausage | Yes | No | Unsatisfactory Progress - discharging without permit. Will initiate Compliance suit. | | | | |
| M. Lepidi & Son | Yes | No | Have been sued - $4000 Plus compliance (maintenance problems to be corrected in 30 days) Satisfactory Progress. | | | | |
| Silvis Farms | Yes | Yes | | | | | X |
| Westmoreland Dairy | Yes | Yes | | | | | X |
| Rathgeb Dairy | Yes | Yes | | | | | X |
| Shrums Dairy | Yes | Yes | | | | | X |
| Westinghouse Youngwood | Yes | Yes | | | | | X |
| Castle Provision | Yes | Yes | | | | | X |
| Harbaugh Coal | Yes | Yes | | | | | X |

# INDUSTRIAL WASTE STATUS
# MONONGAHELA RIVER BASIN

| County<br>WESTMORELAND<br>Name and Location | Treatment Provided | Does Treatment Meet Standards? | Enforcement Action Status | Project Status | | | |
|---|---|---|---|---|---|---|---|
| | | | | Schedule | Final Plans | Under Construction | Plant in Operation or Discharge Abated |
| Robertshaw Fulton | Yes | Yes | | | | | X |
| Pifferetti Packing | Yes | Yes | | | | | X |
| Miller Rendering | Yes | Yes | | | | | X |
| Westinghouse Waltz Mills | Yes | Yes | | | | | X |
| JEANNETTE | | | | | | | |
| Jeannette Glass | Yes | Yes | | | | | X |
| Elliott Co. | Yes | Yes | | | | | X |
| General Tire & Rubber | Yes | Yes | | | | | X |
| MONESSEN | | | | | | | |
| American Chain & Cable | Yes | Yes | | | | | X |
| Pittsburgh Steel Co. | Yes | Yes | | | | | X |
| NORTH HUNTINGDON TWP. | | | | | | | |
| Pittsburgh Reflector | Yes | Yes | | | | | X |
| Brewster Bumper | Yes | Yes | | | | | X |
| New Hope Dairy | Yes | Yes | | | | | X |
| Russel Standard Co. | Yes | Yes | | | | | X |

## INDUSTRIAL WASTE STATUS
## MONONGAHELA RIVER BASIN

| County<br>WESTMORELAND<br>Name and Location | Treatment Provided | Does Treatment Meet Standards? | Enforcement Action Status | Project Status | | | |
|---|---|---|---|---|---|---|---|
| | | | | Schedule | Final Plans | Under Construction | Plant in Operation or Discharge Abated |
| Tank Truck Rental | Yes | Yes | | | | | X |
| Abco Inc. | Yes | Yes | | | | | X |
| Kwik Kleen Car Wash | No | No | Unsatisfactory Progress - summary action to be taken | | | | |
| MT. PLEASANT BORO | | | | | | | |
| Lennox Crystal | Yes | Yes | | | | | X |
| SOUTH GREENSBURG BORO | | | | | | | |
| Pittsburgh Plate Glass | Yes | Yes | | | | | X |
| I.T.E. Circuit Breaker | Yes | Yes | | | | | X |
| Walworth Co. | Yes | Yes | | | | | X |
| SOUTH WEST GREENSBURG BORO | | | | | | | |
| Culligan Water | Yes | Yes | | | | | X |
| TRAFFORD BORO | | | | | | | |
| Westinghouse | Yes | Yes | | | | | X |
| Firth Sterling | Yes | Yes | | | | | X |

## INDUSTRIAL WASTE STATUS
## MONONGAHELA RIVER BASIN

| County<br>WESTMORELAND<br>Name and Location | Treatment Provided | Does Treatment Meet Standards? | Enforcement Action Status | Project Status: Schedule | Project Status: Final Plans | Project Status: Under Construction | Project Status: Plant in Operation or Discharge Abated |
|---|---|---|---|---|---|---|---|
| **WEST NEWTON BORO** | | | | | | | |
| Standard Railway Fusee | Yes | Yes | | | | | X |
| **DONEGAL TWP.** | | | | | | | |
| Stull Laundromat | No | No | Unsatisfactory Progress - summary action to be initiated | | | | |
| **EAST HUNTINGDON TWP.** | | | | | | | |
| E. B. Hostoffer | Yes | Yes | | | | | X |
| Glick Brothers | Yes | Yes | | | | | X |
| Screw & Bolt Division | Yes | No | Satisfactory Progress. Will reinspect. | | | X | |
| Smelko Brothers | Yes | Yes | | | | | X |
| Ruffsdale Coal | Yes | Yes | | | | | X |
| **FRANKLIN TWP.** | | | | | | | |
| Beckwith Machinery | Yes | Yes | | | | | X |
| Pittsburgh Aluminum Alloys Inc. | Yes | Yes | Were sued - paid $2000 and monthly payments | | | | |

# INDUSTRIAL WASTE STATUS
# MONONGAHELA RIVER BASIN

| County<br>WESTMORELAND<br>Name and Location | Treatment Provided | Does Treatment Meet Standards? | Enforcement Action Status | Project Status | | | |
|---|---|---|---|---|---|---|---|
| | | | | Schedule | Final Plans | Under Construction | Plant in Operation or Discharge Abated |
| **MT. PLEASANT TWP.** | | | | | | | |
| Will G. Keck Inc. | Yes | Yes | | | | | X |
| **PENN TWP.** | | | | | | | |
| Mellon Industrial Research | Yes | Yes | | | | | X |
| Westinghouse | Yes | Yes | | | | | X |
| Oakford Park | Yes | Yes | | | | | X |
| Boldans Landfill | No | No | Satisfactory Progress - referred to attorney 4-22-70 Have applied for permit. | | | | |
| Ramalexs Landfill | Yes | Yes | | | | | X |
| **ROSTRAVER TWP.** | | | | | | | |
| Republic Steel | Yes | Yes | | | | | X |
| Weiss Packing | Yes | Yes | | | | | X |
| Westmoreland Paving | No | No | Referred to Attorney. Strike Force investigating. | | | | |

## INDUSTRIAL WASTE STATUS
## MONONGAHELA RIVER BASIN

| County<br>WESTMORELAND<br>Name and Location | Treatment Provided | Does Treatment Meet Standards? | Enforcement Action Status | Project Status | | | |
|---|---|---|---|---|---|---|---|
| | | | | Schedule | Final Plans | Under Construction | Plant in Operation or Discharge Abated |
| **SEWICKLEY TWP.** | | | | | | | |
| Westinghouse | Yes | Yes | | | | | X |
| Pittsburgh Coal Co. | Yes | Yes | | | | | X |
| S & S Chrome Plating | Yes | Yes | | | | | X |
| Swank Landfill | Yes | Yes | | | | | X |
| Wach Landfill | Yes | Yes | | | | | X |
| **SMITHTON BORO.** | | | | | | | |
| Jones Brewing | Yes | No | Satisfactory Progress - upgrade order 2-26-69 | X | | | |
| **SOUTH HUNTINGDON TWP.** | | | | | | | |
| Eastern Associated Coal Co. | Yes | Yes | | | | | X |
| Mill Service | Yes | Yes | | | | | X |
| **UNITY TWP.** | | | | | | | |
| Pleasant Unity Packing | Yes | Yes | | | | | X |
| Moyher Schultz | Yes | Yes | | | | | X |
| Bennetts Dairy | Yes | Yes | | | | | X |

## INDUSTRIAL WASTE STATUS
## MONONGAHELA RIVER BASIN

| County<br>SOMERSET<br>Name and Location | Treatment Provided | Does Treatment Meet Standards? | Enforcement Action Status | Project Status: Schedule | Project Status: Final Plans | Project Status: Under Construction | Project Status: Plant in Operation or Discharge Abated |
|---|---|---|---|---|---|---|---|
| BROTHERSVALLEY TWP. | | | | | | | |
| Pine Hill Coal Co. | Yes | Yes | | | | | X |
| Ponfeigh Coal Co. | Yes | Yes | | | | | X |
| JEFFERSON TWP. | | | | | | | |
| Somerset Limestone | Yes | Yes | | | | | X |
| SOMERSET TWP. | | | | | | | |
| A. W. Francis | No | No | Unsatisfactory Progress. Complaint in equity being filed August-71 in Somerset Court | | | | |
| Devilbiss Co. | Yes | Yes | | | | | X |
| Crane Co. | Yes | Yes | | | | | X |
| Somerset Limestone | Yes | Yes | | | | | X |

# SEWERAGE STATUS
# MONONGAHELA RIVER BASIN

| County<br>ALLEGHENY<br>Name and Location | Treatment Provided | Does Treatment Meet Standards? | Enforcement Action Status | Project Status: Schedule | Project Status: Final Plans | Project Status: Under Construction | Project Status: Plant in Operation or Discharge Abated |
|---|---|---|---|---|---|---|---|
| **PENN HILLS TWP.** | | | | | | | |
| Long Road | Yes | Yes | Upgrade order<br>6-21-71 | | | | X |
| Gascola | Yes | Yes | Upgrade order<br>6-21-71 | | | | X |
| **MCKEESPORT** | | | | | | | |
| McKeesport Sanitary Authority | Yes | No | Upgrade order<br>1-16-68<br>Satisfactory progress | | X | | X |
| **WEST MIFFLIN BORO** | | | | | | | |
| Thompson Run Sewage Treatment Plant | Yes | Yes | Upgrade order<br>6-21-71 | | | | X |
| New England Sewage Treatment Plant | Yes | Yes | Upgrade order<br>6-21-71 | | | | |
| Kenmore Manor | Yes | Yes | | | | | X |
| Kenywood Park | Yes | No | Upgrade order<br>1-16-68<br>Satisfactory Progress | | | X | X |

## SEWERAGE STATUS
## MONONGAHELA RIVER BASIN

| County<br>ALLEGHENY<br>Name and Location | Treatment Provided | Does Treatment Meet Standards? | Enforcement Action Status | Project Status | | | |
|---|---|---|---|---|---|---|---|
| | | | | Schedule | Final Plans | Under Construction | Plant in Operation or Discharge Abated |
| BETHEL PARK BORO | | | | | | | |
| Bethel Park Municipal Sewer Authority | Yes | Yes | Upgrade order 6-21-71 | | | | X |
| CLAIRTON | | | | | | | |
| Clairton Municipal Sewer System | Yes | No | Upgrade order 1-16-68 Satisfactory progress | | X | | X |
| DUQUESNE | | | | | | | |
| Duquesne MSS | Yes | Yes | | | | | X |
| NORTH VERSAILLES | | | | | | | |
| Crestas Plan | Yes | Yes | Upgrade order 6-21-71 | | | | X |
| PLUM BORO | | | | | | | |
| Holiday Park | Yes | Yes | Upgrade order 6-21-71 | | | | X |
| Mark Haven STP | Yes | Yes | Upgrade order 6-21-71 | | | | X |
| DRAVOSBURG BORO | | | | | | | |
| Dravosburg Sanitary Authority | Yes | Yes | | | | | X |

## SEWERAGE STATUS
## MONONGAHELA RIVER BASIN

| County<br>ALLEGHENY<br>Name and Location | Treatment Provided | Does Treatment Meet Standards? | Enforcement Action Status | Project Status |  |  |  |
|---|---|---|---|---|---|---|---|
|  |  |  |  | Schedule | Final Plans | Under Construction | Plant in Operation or Discharge Abated |
| **ELIZABETH BORO** |  |  |  |  |  |  |  |
| Elizabeth MSA | Yes | No | Upgrade order 1-16-68 Unsatisfactory Progress Preparation for legal referral |  |  |  | X |
| **GLASSPORT MSS** |  |  |  |  |  |  |  |
| Glassport MSS | Yes | Yes |  |  |  |  | X |
| **JEFFERSON BORO** |  |  |  |  |  |  |  |
| Jefferson Hills | Yes | Yes |  |  |  |  | X |
| Chapel Hill | Yes | Yes |  |  |  |  | X |
| Firth Sterling | Yes | No | Upgrade order 6-21-71 |  |  |  | X |
| **PLEASANT HILLS BORO** |  |  |  |  |  |  |  |
| Pleasant Hills MA | Yes | Yes | Upgrade order 6-21-71 |  |  |  | X |
| **ELIZABETH TWP.** |  |  |  |  |  |  |  |
| Elizabeth Twp. MSA | Yes | Yes |  |  |  |  | X |

SEWERAGE STATUS
MONONGAHELA RIVER BASIN

| County<br>ALLEGHENY<br>Name and Location | Treatment Provided | Does Treatment Meet Standards? | Enforcement Action Status | Project Status | | | |
|---|---|---|---|---|---|---|---|
| | | | | Schedule | Final Plans | Under Construction | Plant in Operation or Discharge Abated |
| Scenery Drive | No | | Referred for legal action 7-30-71 Unsatisfactory Progress | | | | |
| **FORWARD TWP.** | | | | | | | |
| Ligget Spring and Axle | No | | Referred for legal action | | | | |
| **WEST ELIZABETH BORO** | | | | | | | |
| West Elizabeth MS | No | | Found in contempt of court for failure to treat. Under court imposed schedule | | X | | |

## SEWERAGE STATUS
## MONONGAHELA RIVER BASIN

| County<br>FAYETTE<br>Name and Location | Treatment Provided | Does Treatment Meet Standards? | Enforcement Action Status | Project Status | | | |
|---|---|---|---|---|---|---|---|
| | | | | Schedule | Final Plans | Under Construction | Plant in Operation or Discharge Abated |
| **CONNELLSVILLE** | | | | | | | |
| Connellsville MS | Yes | No | Upgrade order 10-24-69 Satisfactory progress | | | | X |
| **UNIONTOWN** | | | | | | | |
| Uniontown MSS | Yes | No | Upgrade order 6-4-70 Satisfactory Progress | X | | | X |
| **BROWNSVILLE BORO** | | | | | | | |
| Brownsville MA | Yes | Yes | | | | | X |
| **MASONTOWN BORO** | | | | | | | |
| Masontown Big Run | Yes | Yes | | | | | X |
| Masontown Cats Creek | Yes | Yes | | | | | X |
| **SOUTH CONNELLSVILLE** | | | | | | | |
| South Connellsville MA | Yes | No | Upgrade order 10-24-69 Satisfactory progress | | | | X |

## SEWERAGE STATUS
## MONONGAHELA RIVER BASIN

| County<br>FAYETTE<br>Name and Location | Treatment Provided | Does Treatment Meet Standards? | Enforcement Action Status | Project Status: Schedule | Project Status: Final Plans | Project Status: Under Construction | Project Status: Plant in Operation or Discharge Abated |
|---|---|---|---|---|---|---|---|
| BELLE VERNON BORO | | | | | | | |
| Municipal Authority of Belle Vernon | Yes | Yes | | | | | X |
| BROWNSVILLE TWP. | | | | | | | |
| Brownsville Twp. MSS | Yes | Yes | | | | | X |
| BULLSKIN TWP. | | | | | | | |
| Merit Manor | Yes | Yes | | | | | X |
| DAWSON BORO | | | | | | | |
| Dawson MSS | No | | Under court mandamus Unsatisfactory Progress Contempt proceedings recommended | | | | |
| DUNBAR BORO | | | | | | | |
| Dunbar Boro | No | | Under court mandamus Unsatisfactory Progress Contempt proceedings recommended | | | | |

| County<br>FAYETTE<br>Name and Location | Treatment Provided | Does Treatment Meet Standards? | Enforcement Action Status | Project Status | | | |
|---|---|---|---|---|---|---|---|
| | | | | Schedule | Final Plans | Under Construction | Plant in Operation or Discharge Abated |
| **DUNBAR TOWNSHIP** | | | | | | | |
| Dunbar Township MSS | No | | Under court mandamus<br>Unsatisfactory Progress<br>Contempt proceedings recommended | | | | |
| **FAYETTE CITY BORO** | | | | | | | |
| Fayette City MA | Yes | No | Upgrade order 1-16-68<br>Unsatisfactory Progress.<br>Legal action in preparation | | | | X |
| **LUZERNE TOWNSHIP** | | | | | | | |
| Luzerne Township MSS | Yes | No | Preparation of order in progress | | | | X |
| **NEWELL BORO** | | | | | | | |
| Newell Boro MSS | Yes | Yes | | | | | X |
| **NORTH HUNTINGDON TWP.** | | | | | | | |
| North Union Twp. MSS | No | | Referred for legal action 8-19-70<br>Unsatisfactory Progress | | X | | |

## SEWERAGE STATUS
## MONONGAHELA RIVER BASIN

| County<br>FAYETTE<br>Name and Location | Treatment Provided | Does Treatment Meet Standards? | Enforcement Action Status | Project Status | | | |
|---|---|---|---|---|---|---|---|
| | | | | Schedule | Final Plans | Under Construction | Plant in Operation or Discharge Abated |
| Industrial Park | Yes | Yes | | | | | X |
| OHIOPYLE BORO | | | | | | | |
| Ohiopyle Municipal SS | Yes | Yes | | | | | X |
| PERRYOPOLIS BORO | | | | | | | |
| Perryopolis Boro | Yes | Yes | | | | | X |
| POINT MARION BORO | | | | | | | |
| Point Marion MS | No | | Under court mandamus<br>Unsatisfactory Progress | | | | |
| REDSTONE TWP. | | | | | | | |
| Cardale STP | Yes | Yes | | | | | X |
| SMITHFIELD BORO | | | | | | | |
| Smithfield MSS | No | No | Under court mandamus<br>Unsatisfactory Progress<br>Contempt proceedings being prepared | | | | |

## SEWERAGE STATUS
## MONONGAHELA RIVER BASIN

| County<br>FAYETTE<br>Name and Location | Treatment Provided | Does Treatment Meet Standards? | Enforcement Action Status | Project Status: Schedule | Final Plans | Under Construction | Plant in Operation or Discharge Abated |
|---|---|---|---|---|---|---|---|
| SOUTH UNION TWP. | | | | | | | |
| South Union Twp. MSS | No | | Unsatisfactory Progress<br>Legal action to require construction of approved facilities being prepared | | X | | |
| Highland Manor ST | Yes | Yes | | | | | X |
| SPRINGHILL TWP. | | | | | | | |
| Gallatin Joint School | Yes | No | Upgrade order 5-27-70<br>Satisfactory progress | | | | X |
| VANDERBILT BORO | | | | | | | |
| Vanderbilt MSS | No | | Under court mandamus<br>Unsatisfactory Progress | | | | |

## SEWERAGE STATUS
## MONONGAHELA RIVER BASIN

| County<br>GREENE<br>Name and Location | Treatment Provided | Does Treatment Meet Standards? | Enforcement Action Status | Project Status | | | |
|---|---|---|---|---|---|---|---|
| | | | | Schedule | Final Plans | Under Construction | Plant in Operation or Discharge Abated |
| **WAYNESBURG BORO** | | | | | | | |
| Waynesburg MSS | Yes | Yes | | | | | X |
| **CARMICHAELS BORO** | | | | | | | |
| Carmichaels MSA | Yes | No | Upgrade order 6-4-70 Unsatisfactory Progress Referral for legal action in preparation | | | | X |
| **CUMBERLAND TWP.** | | | | | | | |
| Buckeye Coal Company | Yes | No | Upgrade order 5-27-70 ownership of facilities uncertain | | | | X |
| **DUNKARD TWP.** | | | | | | | |
| Dunkard MSA | Yes | No | Upgrade order 1-16-68 Satisfactory Progress | | | | X |

# SEWERAGE STATUS
# MONONGAHELA RIVER BASIN

| County<br>GREENE<br>Name and Location | Treatment Provided | Does Treatment Meet Standards? | Enforcement Action Status | Project Status<br>Schedule | <br>Final Plans | <br>Under Construction | <br>Plant in Operation or Discharge Abated |
|---|---|---|---|---|---|---|---|
| **GREENSBORO BORO** | | | | | | | |
| Greensboro Boro | No | | Under court mandamu<br>unsatisfactory progress<br>Contempt action recommended | | | | |
| **JEFFERSON TWP.** | | | | | | | |
| Jefferson Township MSS | Yes | No | Preparation of orde in progress | | | | X |
| **MORGAN TWP.** | | | | | | | |
| Teagarden Home Authority | Yes | No | Upgrade order 6-4-70<br>Satisfactory Progress | | | | X |
| **PERRY TWP.** | | | | | | | |
| Perry Township MSS | No | | Under court mandamu 1-30-68<br>Unsatisfactory Progress permit issued 6-70 | | | | |

## SEWERAGE STATUS
## MONONGAHELA RIVER BASIN

| County<br>GREENE<br>Name and Location | Treatment Provided | Does Treatment Meet Standards? | Enforcement Action Status | Project Status |  |  |  |
|---|---|---|---|---|---|---|---|
|  |  |  |  | Schedule | Final Plans | Under Construction | Plant in Operation or Discharge Abated |
| **WAYNE TWP.** |  |  |  |  |  |  |  |
| Brave Water and Sewer Authority | Yes | Yes |  |  |  |  | X |

## SEWERAGE STATUS
## MONONGAHELA RIVER BASIN

| County<br>SOMERSET<br>Name and Location | Treatment Provided | Does Treatment Meet Standards? | Enforcement Action Status | Project Status | | | |
|---|---|---|---|---|---|---|---|
| | | | | Schedule | Final Plans | Under Construction | Plant in Operation or Discharge Abated |
| **MEYERSDALE BORO** | | | | | | | |
| Meyersdale MSS | Yes | Yes | Upgrade order 3-26-70 Satisfactory Progress | X | | | X |
| **SOMERSET BORO** | | | | | | | |
| Somerset MSA | Yes | Yes | | | | | X |
| **BERLIN BORO** | | | | | | | |
| Berlin MSS | Yes | No | Upgrade order 1-16-68 Satisfactory Progress | | X | | X |
| **CONFLUENCE BORO** | | | | | | | |
| Confluence MSS | No | | Under court mandamus Satisfactory Progress | X | X | | |
| **GARRETT BORO** | | | | | | | |
| Garrett MSS | No | | Under court mandamus Satisfactory Progress | X | X | | |

# SEWERAGE STATUS
# MONONGAHELA RIVER BASIN

| County<br>SOMERSET<br>Name and Location | Treatment Provided | Does Treatment Meet Standards? | Enforcement Action Status | Project Status |  |  |  |
|---|---|---|---|---|---|---|---|
|  |  |  |  | Schedule | Final Plans | Under Construction | Plant in Operation or Discharge Abated |
| **ROCKWOOD BORO** |  |  |  |  |  |  |  |
| Rockwood MSS | Yes | No | 10-15-70 referred for punitive and compliance action Unsatisfactory Progress |  |  |  | X |
| **SALISBURY BORO** |  |  |  |  |  |  |  |
| Salisbury MSS | No |  | ordered to provide treatment 6-4-71 Schedule due 9-4-71 |  |  |  |  |
| **SOMERSET TWP.** |  |  |  |  |  |  |  |
| Somerset Township MA | No |  | ordered to provide treatment 3-5-71 Satisfactory progress | X |  |  |  |

## SEWERAGF STATUS
## MONONGAHELA RIVER BASIN

| County<br>WASHINGTON<br>Name and Location | Treatment Provided | Does Treatment Meet Standards? | Enforcement Action Status | Project Status |  |  |  |
|---|---|---|---|---|---|---|---|
|  |  |  |  | Schedule | Final Plans | Under Construction | Plant in Operation or Discharge Abated |
| **DONORA BORO** |  |  |  |  |  |  |  |
| Monongahela Valley Authority | Yes | Yes |  |  |  |  | X |
| **CALIFORNIA BORO** |  |  |  |  |  |  |  |
| California MSS | Yes | Yes |  |  |  |  | X |
| California Teachers College | No |  | ordered to connect to municipal system<br>Satisfactory Progress |  |  |  |  |
| **CENTERVILLE BORO** |  |  |  |  |  |  |  |
| Centerville MSS | Yes | Yes |  |  |  |  | X |
| **CHARLEROI BORO** |  |  |  |  |  |  |  |
| Authority Boro. Charleroi | Yes | Yes |  |  |  |  | X |
| **MONONGAHELA** |  |  |  |  |  |  |  |
| Monongahela MSA | Yes | No | Upgrade order 1-16-68<br>Unsatisfactory Progress<br>Preparation of referral for legal action in progress |  |  |  | X |

# SEWERAGE STATUS
# MONONGAHELA RIVER BASIN

| County<br>WASHINGTON<br>Name and Location | Treatment Provided | Does Treatment Meet Standards? | Enforcement Action Status | Project Status | | | |
|---|---|---|---|---|---|---|---|
| | | | | Schedule | Final Plans | Under Construction | Plant in Operation or Discharge Abated |
| **NEW EAGLE BORO** | | | | | | | |
| Hemlock STP | Yes | Yes | | | | | X |
| Monroe STP | Yes | Yes | | | | | X |
| **ALLENPORT BORO** | | | | | | | |
| Allenport Boro | No | | Under court schedule Satisfactory progress | | X | | |
| Pittsburgh Steel Company | No | | Connect to Allenport sewers when available | | | | |
| **COKEBURG BORO** | | | | | | | |
| Cokeburg MSS | No | | Under court mandamus Satisfactory progress | | X | | |
| **EAST BETHLEHEM TWP.** | | | | | | | |
| East Bethlehem Twp. MS | No | | Unsatisfactory Progress Legal action to require construction of approved facilities recommended | | X | | |

## SEWERAGE STATUS
## MONONGAHELA RIVER BASIN

| County<br>WASHINGTON<br>Name and Location | Treatment Provided | Does Treatment Meet Standards? | Enforcement Action Status | Project Status: Schedule | Project Status: Final Plans | Project Status: Under Construction | Project Status: Plant in Operation or Discharge Abated |
|---|---|---|---|---|---|---|---|
| **ELCO BORO** | | | | | | | |
| Elco MSS | No | | Under court schedule Satisfactory progress | | X | | |
| **FINLEYVILLE BORO** | | | | | | | |
| Finleyville MSS | No | | Under court mandamus Satisfactory Progress | | X | | |
| **MARIANNA BORO** | | | | | | | |
| Marianna MSS | No | | Under court mandamus 10-10-67 Unsatisfactory Progress Contempt of court proceeding filed. | | | | |
| **ROSCOE BORO** | | | | | | | |
| Roscoe MSS | No | | Under court schedule Satisfactory Progress | | X | | |

## SEWERAGE STATUS
## MONONGAHELA RIVER BASIN

| County<br>WASHINGTON<br>Name and Location | Treatment Provided | Does Treatment Meet Standards? | Enforcement Action Status | Project Status: Schedule | Project Status: Final Plans | Project Status: Under Construction | Project Status: Plant in Operation or Discharge Abated |
|---|---|---|---|---|---|---|---|
| **STOCKDALE BORO** | | | | | | | |
| Stockdale MSS | No | | Under court schedule. Satisfactory Progress | | X | | |
| **UNION TWP.** | | | | | | | |
| Union Township MSS | No | | Satisfactory Progress | | X | | |
| **WEST BROWNSVILLE BORO** | | | | | | | |
| West Brownsville MS | No | | Under court mandamus Unsatisfactory Progress | | | | |
| **WEST PIKE RUN TWP.** | | | | | | | |
| West Pike Run Crescent | Yes | No | Order municipality to take over plant and upgrade Unsatisfactory Progress | | | | |

## SEWERAGE STATUS
## MONONGAHELA RIVER BASIN

| County<br>WESTMORELAND<br>Name and Location | Treatment Provided | Does Treatment Meet Standards? | Enforcement Action Status | Project Status | | | |
|---|---|---|---|---|---|---|---|
| | | | | Schedule | Final Plans | Under Construction | Plant in Operation or Discharge Abated |
| **HEMPFIELD TWP.** | | | | | | | |
| Green Ridge | Yes | Yes | 6-25-71 Upgrade order | | | | X |
| Rolling Hills | Yes | Yes | 6-25-71 Upgrade order | | | | X |
| New Stanton | Yes | Yes | 6-25-71 Upgrade order | | | | X |
| Eastwood Stone Villa | Yes | Yes | 6-25-71 Upgrade order | | | | X |
| Carbon Area | Yes | Yes | 6-25-71 Upgrade order | | | | X |
| West Hempfield Plaza | Yes | Yes | Under upgrade order 6-25-71 | | | | X |
| L & D Building Company | Yes | No | Upgrade order 6-25-71 | | | | X |
| **GREENSBURG** | | | | | | | |
| Greater Greensburg SA | Yes | Yes | | | | | X |
| Greensburg City | Yes | Yes | Upgrade order 6-25-71 | | | | X |
| **JEANNETTE** | | | | | | | |
| Jeanette MSS | Yes | Yes | Upgrade order 6-24-71 | | | | X |

# SEWERAGE STATUS
# MONONGAHELA RIVER BASIN

| County<br>WESTMORELAND<br>Name and Location | Treatment Provided | Does Treatment Meet Standards? | Enforcement Action Status | Project Status | | | |
|---|---|---|---|---|---|---|---|
| | | | | Schedule | Final Plans | Under Construction | Plant in Operation or Discharge Abated |
| NORTH HUNTINGDON TWP. | | | | | | | |
| North Huntingdon MS | No | | Under court mandamu Satisfactory Progress | | X | | |
| Indian Lake STP | Yes | Yes | Upgrade order 6-25-71 | | | | X |
| Susan Ekin STP | Yes | Yes | Upgrade order 6-25-71 | | | | X |
| Country Hills | Yes | Yes | Upgrade order 6-25-71 | | | | X |
| Youghiogheny STP | Yes | No | Upgrade order 10-24-69 | X | | | X |
| Motel Management Company | Yes | No | Upgrade order 6-25-71 | | | | X |
| Pittsburgh Reflector | No | | Referred for legal action Unsatisfactory Progress | | | | |
| IRWIN BORO | | | | | | | |
| Irwin MSS | No | | Under court mandamu Contempt proceeding pending. | | | | |

| County'<br>WESTMORELAND<br>Name and Location | Treatment Provided | Does Treatment Meet Standards? | Enforcement Action Status | Project Status | | | |
|---|---|---|---|---|---|---|---|
| | | | | Schedule | Final Plans | Under Construction | Plant in Operation or Discharge Abated |
| **MT. PLEASANT BORO** | | | | | | | |
| Mt. Pleasant Municipal Authority | Yes | Yes | | | | | X |
| **SCOTTDALE BORO** | | | | | | | |
| West Fayette Municipal Authority | Yes | Yes | | | | | X |
| **WEST NEWTON BORO** | | | | | | | |
| West Newton MSS | No | | Under court mandamus 6-29-66<br>Unsatisfactory Progress<br>Cannot sell financing bonds | X | X | | |
| **YOUNGWOOD BORO** | | | | | | | |
| Youngwood MSS | Yes | Yes | Upgrade order 6-24-71 | | | | X |
| **EAST HUNTINGDON TWP.** | | | | | | | |
| Screw Bolt Corporation | Yes | No | Upgrade order 5-70<br>Satisfactory Progress | | | X | X |

## SEWERAGE STATUS
## MONONGAHELA RIVER BASIN

| County<br>WESTMORELAND<br>Name and Location | Treatment Provided | Does Treatment Meet Standards? | Enforcement Action Status | Project Status | | | |
|---|---|---|---|---|---|---|---|
| | | | | Schedule | Final Plans | Under Construction | Plant in Operation or Discharge Abated |
| **EXPORT BORO** | | | | | | | |
| Export MSS | No | No | Pending court mandamus filed 2/68 Satisfactory Progress | | | | |
| **FRANKLIN TWP.** | | | | | | | |
| Franklin Township MS | Yes | Yes | | | | | X |
| Bel Air Manor | Yes | Yes | Upgrade order 6-22-71 | | | | X |
| Pine Acres | No | | Referred for legal action on 12-30-70 Unsatisfactory Progress | | | | |
| Franklin Estate | Yes | Yes | Upgrade order 6-71 | | | | X |
| **MANOR BORO** | | | | | | | |
| Manor MSS | No | | Under court Mandamus Regionaliaation order to be issued. Unsatisfactory Progress | | | | |

## SEWERAGE STATUS
## MONONGAHELA RIVER BASIN

| County<br>WESTMORELAND<br>Name and Location | Treatment Provided | Does Treatment Meet Standards? | Enforcement Action Status | Project Status | | | |
|---|---|---|---|---|---|---|---|
| | | | | Schedule | Final Plans | Under Construction | Plant in Operation or Discharge Abated |
| NORTH IRWIN BORO | | | | | | | |
| North Irwin Boro | No | | Order to construct sewer system Satisfactory Progress | | | | |
| PENN TWP. | | | | | | | |
| Harrison City | Yes | No | Upgrade order 6-71 Referred for legal action | | | | X |
| Penn-Level Green Authority | Yes | Yes | Upgrade order 6-71 | | | | X |
| Heather-Penn Hills | Yes | Yes | Upgrade order 6-3-71 | | | | X |
| Pleasant View | No | No | Upgrade order 6-25-71 | | | | |
| Sunrise Estates | Yes | Yes | Upgrade order 6-25-71 | | | | X |
| Rose Acres | Yes | Yes | Upgrade order 6-25-71 | | | | X |
| ROSTRAVER TWP. | | | | | | | |
| Rostraver Sanitary Authority | No | | Under court mandamus 12-21-70 Unsatisfactory Progress | | | | |

## SEWERAGE STATUS
## MONONGAHELA RIVER BASIN

| County<br>WESTMORELAND<br>Name and Location | Treatment Provided | Does Treatment Meet Standards? | Enforcement Action Status | Project Status: Schedule | Project Status: Final Plans | Project Status: Under Construction | Project Status: Plant in Operation or Discharge Abated |
|---|---|---|---|---|---|---|---|
| Rehoboth Valley Industrial District | Yes | Yes | | | | | X |
| **SMITHTON BORO** | | | | | | | |
| Smithton MSS | No | No | Under court mandamus<br>Unsatisfactory Progress | | X | | |
| **SUTERVILLE BORO** | | | | | | | |
| Sutersville MSS | No | No | Order to treat or abate<br>Unsatisfactory Progress | | | | |

## MINE DRAINAGE STATUS - DEEP MINES
## MONONGAHELA RIVER BASIN

| County<br>ALLEGHENY<br>Name and Location | Treatment Provided | Does Treatment Meet Standards? | Enforcement Action | Project Status | | | |
|---|---|---|---|---|---|---|---|
| | | | | Schedule | Final Plans | Under Construction | Plant in Operation or Discharge Abated |
| Republic Steel Corp.<br>Plum Borough | No | No Discharge | | | | | |
| **FAYETTE** | | | | | | | |
| McGee Coal Co.<br>Georges Township | No | No Discharge | | | | | |
| George Skovran Jr.<br>Luzerne Township | No | No Discharge | | | | | |
| National Mines Corp.<br>Luzerne Township | Yes | No<br>9 mg/l iron | Violation Notice issued follow-up inspection needed | | | | |

470c

## MINE DRAINAGE STATUS - DEEP MINES
## MONONGAHELA RIVER BASIN

| County<br>GREENE<br>Name and Location | Treatment Provided | Does Treatment Meet Standards? | Enforcement Action | Project Status | | | |
|---|---|---|---|---|---|---|---|
| | | | | Schedule | Final Plans | Under Construction | Plant in Operation or Discharge Abated |
| National Mines Corp.<br>Cumberland Township | No | Yes | | | | | |
| National Mines Corp.<br>Cumberland Township | No | Yes | | | | | |
| U. S. Steel Corporation<br>Green Township | Yes | Yes | | | | | |
| Buckeye Coal Co.<br>Cumberland & Monongahela | No | Yes | | | | | |
| Buckeye Coal Co.<br>Cumberland & Monongahela | Yes | Yes | | | | | |
| Buckeye Coal Co.<br>Cumberland & Monongahela | No | No Discharge | | | | | |
| Buckeye Coal Co.<br>Cumberland & Monongahela<br>Cumberland Township | No | Yes | | | | | |
| National Mines Corporation<br>Cumberland Township | No | No<br>17 mg/l iron | Violation Notice issued, follow-up inspection needed | | | | |
| Buckeye Coal Co.<br>Cumberland & Monongahela | No | Yes | | | | | |
| uckeye Coal Co.<br>Cumberland & Monongahela | Yes | Yes | | | | | |
| Duquesne Light Co.<br>Dunkard Township | No | Yes | | | | | |
| Duquesne Light Co.<br>Dunkard Township | No | No Discharge | | | | | |

## MINE DRAINAGE STATUS - DEEP MINES
## MONONGAHELA RIVER BASIN

| County<br>GREENE<br>Name and Location | Treatment Provided | Does Treatment Meet Standards? | Enforcement Action | Project Status | | | |
|---|---|---|---|---|---|---|---|
| | | | | Schedule | Final Plans | Under Construction | Plant in Operation or Discharge Abated |
| Molnar Coal Mining Co.<br>Dunkard Township | No | No Discharge | | | | | |
| Vincent Blout<br>Dunkard Township | No | No Discharge | | | | | |
| Jones & Laughlin Steel Co.<br>Dunkard Township | Yes | Yes | | | | | |
| Raymond N. Chess<br>Dunkard Township | Yes | Yes | | | | | |
| R & S Coal Co.<br>Dunkard Township | No | No Discharge | | | | | |
| Jones & Laughlin Steel Corp.<br>Dunkard Township | No | No Discharge | | | | | |
| Herman Gugliotta<br>Dunkard Township | No | No Discharge | | | | | |
| Duquesne Light Co.<br>Dunkard Township | No | No Discharge | | | | | |
| U. S. Steel Corporation<br>Greene Township | No | Yes | | | | | |
| U. S. Steel Corporation<br>Greene Township | No | Yes | | | | | |
| Gateway Coal Co.<br>Jefferson Township | No | No Discharge | | | | | |
| Gateway Coal Co.<br>Jefferson Township | No | No Discharge | | | | | |

# MINE DRAINAGE STATUS - DEEP MINES
## MONONGAHELA RIVER BASIN

| County<br>GREENE<br>Name and Location | Treatment Provided | Does Treatment Meet Standards? | Enforcement Action | Project Status | | | |
|---|---|---|---|---|---|---|---|
| | | | | Schedule | Final Plans | Under Construction | Plant in Operation or Discharge Abated |
| Dalton Run Coal Co.<br>Shade & Paint Township | No | No Discharge | | | | | |
| U. S. Steel Corporation<br>Monongahela Township | Yes | Yes | | | | | |
| Dunkard Mining Co.<br>Monongahela Township | No | No Discharge | | | | | |
| Duquesne Light Co.<br>Monongahela Township | Yes | Yes | | | | | |
| Gateway Coal Co.<br>Morgan Township | No | Yes | | | | | |
| Republic Steel Corporation<br>S. Huntingdon Township | No | Yes | | | | | |
| Gateway Coal Corporation<br>Morgan Township | No | No Discharge | | | | | |
| Jones & Laughlin Steel<br>Derry Township | No | Yes | | | | | |
| Christopher Coal Co.<br>Perry Township | No | No Discharge | | | | | |
| Christopher Coal Co.<br>Perry Township | No | No Discharge | | | | | |
| Christopher Coal Co.<br>Perry Township | No | No Discharge | | | | | |
| Christopher Coal Co.<br>Perry Township | No | Yes | | | | | |

# MINE DRAINAGE STATUS - DEEP MINES
## MONONGAHELA RIVER BASIN

| County<br>WASHINGTON<br>Name and Location | Treatment Provided | Does Treatment Meet Standards? | Enforcement Action | Project Status | | | |
|---|---|---|---|---|---|---|---|
| | | | | Schedule | Final Plans | Under Construction | Plant in Operation or Discharge Abated |
| Bethlehem Mines Corp.<br>Ellsworth Borough | No | Yes | | | | | |
| Jones & Laughlin Steel Corp.<br>California Borough | No | Yes | | | | | |
| Bell Coal Co.<br>California & Long Branch Borough | No | Yes | | | | | |
| Tremont Mining Co.<br>California Borough | No | No Discharge | | | | | |
| Jones & Laughlin Steel Corp.<br>Centerville Borough | Yes | Yes | | | | | |
| U. S. Steel Corporation<br>New Eagle Borough | No | No Discharge | | | | | |
| U.S. Steel Corporation<br>Carroll Township | No | No Discharge | | | | | |
| Jones & Laughlin Steel Corp.<br>Deemston Borough | Yes | Yes | | | | | |
| Jones & Laughlin Steel Corp.<br>East Bethlehem Township | No | Yes | | | | | |
| Bethlehem Mines Corp.<br>Ellsworth Borough | Yes | Yes | | | | | |
| U. S. Steel Corporation<br>Fallowfield Township | Yes | Yes | | | | | |
| George Zippay & Sons<br>Fallowfield Township | No | No Discharge | | | | | |

## MINE DRAINAGE STATUS - DEEP MINES
## MONONGAHELA RIVER BASIN

| County<br>WASHINGTON<br>Name and Location | Treatment Provided | Does Treatment Meet Standards? | Enforcement Action | Project Status | | | |
|---|---|---|---|---|---|---|---|
| | | | | Schedule | Final Plans | Under Construction | Plant in Operation or Discharge Abated |
| Bethlehem Mines Corp.<br>Marrinna Borough | Yes | Yes | | | | | |
| Jones & Laughlin Steel Corp.<br>North Bethlehem Twp. | No | No Discharge | | | | | |
| Mathies Coal Co.<br>Nottingham Township | Yes | Yes | | | | | |
| Mathies Coal Co.<br>Nottingham Township | Yes | Yes | | | | | |
| Pera Coal Co.<br>Peters Township | No | No Discharge | | | | | |
| Bethlehem Mines Corp.<br>Somerset Township | Yes | Yes | | | | | |
| Jones & Laughlin Steel Corp.<br>West Bethlehem Twp. | No | No Discharge | | | | | |
| Republic Steel Corp.<br>West Bethlehem Twp. | Yes | Yes | | | | | |
| Jones & Laughlin Steel Corp.<br>West Pike Township | Yes | Yes | | | | | |

## MINE DRAINAGE STATUS - DEEP MINES
## MONONGAHELA RIVER BASIN

| County<br>WESTMORELAND<br>Name and Location | Treatment Provided | Does Treatment Meet Standards? | Enforcement Action | Project Status | | | |
|---|---|---|---|---|---|---|---|
| | | | | Schedule | Final Plans | Under Construction | Plant in Operation or Discharge Abated |
| Joseph Klaka<br>Hempfield Township | No | No Discharge | | | | | |
| Eastern Associated Coal Corp.<br>S. &. E. Huntingdon Twps. | Yes | No | Enforcement Conference Held - Corrective Action being taken | | | | |
| Republic Steel Corporation<br>Rostraver Township | Yes | Yes | | | | | |
| Melvin Earl Ansell<br>Sewickley Township | No | No Discharge | | | | | |
| Paul Krevokuch<br>Sewickley Township | No | No Discharge | | | | | |
| S & U Coal Co.<br>Sewickley Township | No | No Discharge | | | | | |
| Pittsburgh Coal Co.<br>Sewickley Township | No | No | Hearing Held in Commonwealth Court - Awaiting Decision | | | | |
| Republic Steel Corporation<br>S. Huntingdon Township | Yes | Yes | | | | | |
| Republic Steel Corporation<br>S. Huntingdon Township | Yes | Yes | | | | | |
| Joseph Law<br>Stoneycreek Township | Yes | Yes | | | | | |

## MINE DRAINAGE STATUS - STRIP MINES
## MONONGAHELA RIVER BASIN

**ACTIVE**

| Name and Location | Treatment Provided | Does Treatment Meet Standards? | Enforcement Action | Project Status | | | |
|---|---|---|---|---|---|---|---|
| | | | | Schedule | Final Plans | Under Construction | Plant in Operation or Discharge Abated |
| #2966BSM105<br>William L. Hill<br>Georges Township<br>Fayette County | Yes | Yes | -NA- | | | | |
| #3368BSM8<br>Leo Ohler<br>Brothersvalley Twp. | Yes | Yes | -NA- | | | | |
| #3369BSM8<br>Croner, Inc.<br>Brothersvalley Twp.<br>Somerset County | Yes | Yes | -NA- | | | | |
| #3366BSM60<br>Beachy & Beachy Coal Company<br>Elk Lick Township<br>Somerset County | Yes | Yes | -NA- | | | | |
| #3366BSM70<br>Sanner Brothers Coal Company<br>Elk Lick Township<br>Somerset County | Yes | Yes | -NA- | | | | |
| #3366BSM120<br>Jonas D. Tice & Monroe J. Tice<br>Elk Lick Township<br>Somerset County | Yes | Yes | -NA- | | | | |

**ACTIVE**

# MINE DRAINAGE STATUS - STRIP MINES
## MONONGAHELA RIVER BASIN

| Name and Location | Treatment Provided | Does Treatment Meet Standards? | Enforcement Action | Project Status | | | |
|---|---|---|---|---|---|---|---|
| | | | | Schedule | Final Plans | Under Construction | Plant in Operation or Discharge Abated |
| #4070BSM1<br>William Scurfield<br>Milford Township<br>Somerset County | Yes | Yes | -NA- | | | | |
| #3366BSM85<br>Croner, Inc.<br>Somerset & Brothersvalley Twps.<br>Somerset County | Yes | Yes | -NA- | | | | |
| #3366BSM82<br>Penn Pocahontas Coal Co.<br>Summit & Brothersvalley Twps.<br>Somerset County | Yes | Yes | -NA- | | | | |
| #3366BSM95<br>Penn Pocahontas Coal Co.<br>Summit Township<br>Somerset County | Yes | Yes | -NA- | | | | |
| #3367BSM31<br>Decker Constr., Co.<br>Summit Township<br>Somerset County | Yes | Yes | -NA- | | | | |
| #3368BSM10<br>Sanner Bros. Coal Co.<br>Summit Township<br>Somerset County | Yes | Yes | -NA- | | | | |

**ACTIVE**

## MINE DRAINAGE STATUS - STRIP MINES
## MONONGAHELA RIVER BASIN

| Name and Location | Treatment Provided | Does Treatment Meet Standards? | Enforcement Action | Project Status | | | |
|---|---|---|---|---|---|---|---|
| | | | | Schedule | Final Plans | Under Construction | Plant in Operation or Discharge Abated |
| #3369BSM3<br>Decker Constr. Co.<br>Summit Township<br>Somerset County | Yes | Yes | -NA- | | | | |
| #4070BSM2<br>Decker Constr. Co.<br>Summit Township<br>Somerset County | Yes | Yes | -NA- | | | | |
| #3369BSM32<br>General Refract. Co.<br>Addison Township<br>Somerset County | Yes | Yes | -NA- | | | | |
| #2969BSM24<br>Harbison-Walker<br>Refractories Co.<br>Stewart Township<br>Fayette County | Yes | Yes | -NA- | | | | |

**ACTIVE**

## MINE DRAINAGE STATUS - STRIP MINES
## MONONGAHELA RIVER BASIN

| Name and Location | Treatment Provided | Does Treatment Meet Standards? | Enforcement Action | Project Status | | | |
|---|---|---|---|---|---|---|---|
| | | | | Schedule | Final Plans | Under Construction | Plant in Operation or Discharge Abated |
| #3270BSM12<br>Chess Coal Company<br>Dunkard Township<br>Greene County | Yes | Yes | -NA- | | | | |
| #2969BSM34<br>Jane Coal Company<br>Jefferson Township<br>Greene County | Yes | Yes | -NA- | | | | |
| #2969BSM36<br>Bortz Coal Co., Inc.<br>Greene & Dunkard Twps.<br>Greene County | Yes | Yes | -NA- | | | | |
| #2966BSM92<br>Dipple & Dipple Coal Company<br>Perry Township<br>Greene County | Yes | Yes | -NA- | | | | |
| #3470BSM1<br>Diamond Fuel Company<br>Elizabeth Township<br>Allegheny County | Yes | Yes | -NA- | | | | |
| #2966BSM7<br>Emil W. Mehrer<br>Hempfield Township<br>Westmoreland County | Yes | Yes | -NA- | | | | |

**ACTIVE**

## MINE DRAINAGE STATUS - STRIP MINES
## MONONGAHELA RIVER BASIN

| Name and Location | Treatment Provided | Does Treatment Meet Standards? | Enforcement Action | Project Status: Schedule | Project Status: Final Plans | Project Status: Under Construction | Project Status: Plant in Operation or Discharge Abated |
|---|---|---|---|---|---|---|---|
| #2966BSM9<br>Emil W. Mehrer<br>Hempfield Township<br>Westmoreland County | Yes | Yes | -NA- | | | | |
| #2966BSM29<br>S & S Coal Company<br>Hempfield Township<br>Westmoreland County | Yes | Yes | -NA- | | | | |
| #2966BSM66<br>H. E. Fox<br>Hempfield Township<br>Westmoreland County | Yes | Yes | -NA- | | | | |
| #2966BSM106<br>Geary-Ridge Coal Co., Inc.<br>Sewickley Township<br>Westmoreland County | Yes | Yes | -NA- | | | | |
| #2966BSM109<br>Melvin Earl Ansell<br>Sewickley Township<br>Westmoreland County | Yes | Yes | -NA- | | | | |
| #2966BSM46<br>Marsolino Coal & Coke Inc.<br>E. Huntingdon Twp.<br>Westmoreland County | Yes | Yes | -NA- | | | | |

## MINE DRAINAGE STATUS - STRIP MINES
## MONONGAHELA RIVER BASIN

ACTIVE

| Name and Location | Treatment Provided | Does Treatment Meet Standards? | Enforcement Action | Project Status |  |  |  |
|---|---|---|---|---|---|---|---|
|  |  |  |  | Schedule | Final Plans | Under Construction | Plant in Operation or Discharge Abated |
| #2968BSM20<br>Wm. Piccolomini<br>Mt. Pleasant Township<br>Westmoreland County | Yes | Yes | -NA- |  |  |  |  |
| #3471BSM14<br>Weinman Coal & Coke Company<br>Mt. Pleasant Township<br>Westmoreland County | Yes | Yes | -NA- |  |  |  |  |
| #3470BSM14<br>William K. Tedesco<br>Mt. Pleasant Township<br>Westmoreland County | Yes | Yes | -NA- |  |  |  |  |
| #2967BSM22<br>Walter Green, Inc.<br>Dunbar Township<br>Fayette County | Yes | Yes | -NA- |  |  |  |  |
| #2969BSM17<br>United States Steel, Corp.<br>Dunbar Township<br>Fayette County | Yes | Yes | -NA- |  |  |  |  |
| #3370BSM7<br>John Hustosky<br>Franklin Township<br>Fayette County | Yes | Yes | -NA- |  |  |  |  |

ACTIVE

## MINE DRAINAGE STATUS - STRIP MINES
### MONONGAHELA RIVER BASIN

| Name and Location | Treatment Provided | Does Treatment Meet Standards? | Enforcement Action | Project Status | | | |
|---|---|---|---|---|---|---|---|
| | | | | Schedule | Final Plans | Under Construction | Plant in Operation or Discharge Abated |
| #2669BSM6<br>Fred Fiore<br>Jefferson Borough<br>Allegheny County | Yes | Yes | -NA- | | | | |
| #3270BSM16<br>Twilight Industries, Inc.<br>Somerset Township<br>Washington County | Yes | Yes | -NA- | | | | |
| #2666BSM12<br>Protz Brothers Co.<br>Fallowfield Township<br>Washington County | Yes | Yes | -NA- | | | | |
| #2669BSM7<br>Twilight Industries<br>Fallowfield Township<br>Washington County | Yes | Yes | -NA- | | | | |
| #2669BSM9<br>Rostosky Brothers<br>Fallowfield Township<br>Washington County | Yes | Yes | -NA- | | | | |
| #3270BSM13<br>National Industries, Inc.<br>Fallowfield Township<br>Washington County | Yes | Yes | -NA- | | | | |

ACTIVE

## MINE DRAINAGE STATUS - STRIP MINES
## MONONGAHELA RIVER BASIN

| Name and Location | Treatment Provided | Does Treatment Meet Standards? | Enforcement Action | Project Status: Schedule | Project Status: Final Plans | Project Status: Under Construction | Project Status: Plant in Operation or Discharge Abated |
|---|---|---|---|---|---|---|---|
| #3270BSM8<br>Twilight Industries, Inc.<br>West Pike Run Twp.<br>Washington County | Yes | Yes | -NA- | | | | |
| #3270BSM9<br>Jane Coal Co., Inc.<br>Cumberland Township<br>Greene County | Yes | Yes | -NA- | | | | |
| #2966BSM21<br>Genovese Coal Company<br>Dunkard Township<br>Greene County | Yes | Yes | -NA- | | | | |
| #2966BSM80<br>Genovese Coal Company<br>Dunkard Township<br>Greene County | Yes | Yes | -NA- | | | | |
| #2967BSM5<br>Ford and Gaskill<br>Dunkard Township<br>Greene County | Yes | Yes | -NA- | | | | |
| #2967BSM45<br>Genovese Coal Company<br>Dunkard Township<br>Greene County | Yes | Yes | -NA- | | | | |

ACTIVE

## MINE DRAINAGE STATUS - STRIP MINES
### MONONGAHELA RIVER BASIN

| Name and Location | Treatment Provided | Does Treatment Meet Standards? | Enforcement Action | Project Status | | | |
|---|---|---|---|---|---|---|---|
| | | | | Schedule | Final Plans | Under Construction | Plant in Operation or Discharge Abated |
| #3370BSM3<br>Menallen Coke Company<br>Georges Township<br>Fayette County | Yes | Yes | -NA- | | | | |
| #3370BSM9<br>Whyel Coal Company<br>Georges Township<br>Fayette County | Yes | Yes | -NA- | | | | |
| #3370BSM10<br>Genovese Coal Company<br>German Township<br>Fayette County | Yes | Yes | -NA- | | | | |
| #3370BSM17<br>West Pen Coal & Construction Company<br>German Township<br>Fayette County | Yes | Yes | -NA- | | | | |
| #2967BSM6<br>John Puskar<br>Lower Tyrone Township<br>Fayette County | Yes | Yes | -NA- | | | | |
| #3370BSM28<br>Carl Carbonara<br>Luzerne Township<br>Fayette County | Yes | Yes | -NA- | | | | |

## MINE DRAINAGE STATUS - STRIP MINES
## MONONGAHELA RIVER BASIN

**ACTIVE**

| Name and Location | Treatment Provided | Does Treatment Meet Standards? | Enforcement Action | Project Status | | | |
|---|---|---|---|---|---|---|---|
| | | | | Schedule | Final Plans | Under Construction | Plant in Operation or Discharge Abated |
| #3371BSM1<br>Allan R. Fiore, Inc.<br>Luzerne Township<br>Fayette County | Yes | Yes | -NA- | | | | |
| #2966BSM12<br>Steve Krulock<br>Menallen Township<br>Fayette County | Yes | Yes | -NA- | | | | |
| #2966BSM57<br>Pontorero & Sons Coal Company<br>Nicholson Township<br>Fayette County | Yes | Yes | -NA- | | | | |
| #2969BSM12<br>Filliaggi Coal Company<br>Nicholson Township<br>Fayette County | Yes | Yes | -NA- | | | | |
| #3370BSM18<br>Filliaggi Coal Company<br>Nicholson Township<br>Fayette County | Yes | Yes | -NA- | | | | |
| #3370BSM22<br>Genovese Coal Company<br>Nicholson Township<br>Fayette County | Yes | Yes | -NA- | | | | |

## MINE DRAINAGE STATUS - STRIP MINES
## MONONGAHELA RIVER BASIN

**ACTIVE**

| Name and Location | Treatment Provided | Does Treatment Meet Standards? | Enforcement Action | Project Status: Schedule | Project Status: Final Plans | Project Status: Under Construction | Project Status: Plant in Operation or Discharge Abated |
|---|---|---|---|---|---|---|---|
| #2966BSM63<br>Bartoni Coal Co.<br>Georges Township<br>Fayette County | Yes | Yes | -NA- | | | | |
| #2966BSM81<br>Menallen Coke Company<br>Georges Township<br>Fayette County | Yes | Yes | -NA- | | | | |
| #2968BSM18<br>Pontorero & Sons Coal Company<br>Georges Township<br>Fayette County | Yes | Yes | -NA- | | | | |
| #2968BSM23<br>Soberdash Coal & Coke Company<br>Georges Township<br>Fayette County | Yes | Yes | -NA- | | | | |
| #2969BSM23<br>Soberdash Coal & Coke Company<br>Georges Township<br>Fayette County | Yes | Yes | -NA- | | | | |
| #2969BSM6<br>Menallen Coal Company<br>Georges Township<br>Fayette County | Yes | Yes | -NA- | | | | |

ACTIVE

## MINE DRAINAGE STATUS - STRIP MINES
## MONONGAHELA RIVER BASIN

| Name and Location | Treatment Provided | Does Treatment Meet Standards? | Enforcement Action | Project Status: Schedule | Project Status: Final Plans | Project Status: Under Construction | Project Status: Plant in Operation or Discharge Abated |
|---|---|---|---|---|---|---|---|
| #3371BSM17<br>Soberdash Coal & Coke Company<br>Nicholson Township<br>Fayette County | Yes | Yes | -NA- | | | | |
| #2968BSM10<br>Anthony B. Ovitsky & Andrew Cambruzzi<br>Saltlick Township<br>Fayette County | Yes | Yes | -NA- | | | | |
| #3370BSM23<br>Purco Coal Co., Inc.<br>Salilick Township<br>Fayette County | Yes | Yes | -NA- | | | | |
| #2966BSM13<br>Bortz Coal Company<br>Springhill Township<br>Fayette County | Yes | Yes | -NA- | | | | |
| #2967BSM37<br>Bortz Coal Company<br>Springhill Township<br>Fayette County | Yes | Yes | -NA- | | | | |
| #3370BSM14<br>Ruane-Arnold Coal Co.<br>Springhill Township<br>Fayette County | Yes | Yes | -NA- | | | | |

**ACTIVE**

## MINE DRAINAGE STATUS - STRIP MINES
## MONONGAHELA RIVER BASIN

| Name and Location | Treatment Provided | Does Treatment Meet Standards? | Enforcement Action | Project Status: Schedule | Project Status: Final Plans | Project Status: Under Construction | Project Status: Plant in Operation or Discharge Abated |
|---|---|---|---|---|---|---|---|
| #3366BSM83<br>Penn Pocahontas Coal Company<br>Brothersvalley Twp.<br>Somerset County | Yes | Yes | -NA- | | | | |
| #3366BSM81<br>Pine Hill Smokeless Coal Company<br>Brothersvalley Twp.<br>Somerset County | Yes | Yes | -NA- | | | | |
| #3366BSM84<br>Penn Pocahontas Coal Company<br>Brothersvalley Twp.<br>Somerset County | Yes | Yes | -NA- | | | | |
| #3366BSM117<br>John J. Slifco & Chas. R. T/A Slifco Brothers<br>Brothersvalley Twp.<br>Somerset County | Yes | Yes | -NA- | | | | |
| #3367BSM23<br>Star Coal Company<br>Brothersvalley Twp.<br>Somerset County | Yes | Yes | -NA- | | | | |
| #3367BSM28<br>Decker Construction Co.<br>Brothersvalley Twp.<br>Somerset County | Yes | Yes | -NA- | | | | |

NOT STARTED

## MINE DRAINAGE STATUS - STRIP MINES
## MONONGAHELA RIVER BASIN
## (PERMITS ISSUED BUT NOT STARTED)

| Name and Location | Treatment Required | Does Treatment Meet Standards? | Enforcement Action | Project Status | | | |
|---|---|---|---|---|---|---|---|
| | | | | Schedule | Final Plans | Under Construction | Plant in Operation or Discharge Abated |
| #3470BSM5<br>Twilight Industries<br>S. Hunt. Twp.<br>Westmoreland County | Yes | Yes | -NA- | | | | |
| #2966BSM103<br>Palmerino Co., Inc.<br>E. Hunt. Twp.<br>Westmoreland County | Yes | Yes | -NA- | | | | |
| #2967BSM41<br>Marsolino Coal & Coke<br>E. Hunt. Twp.<br>Westmoreland County | Yes | Yes | -NA- | | | | |
| #3471BSM13<br>Paul W. Kendi & Sons<br>E. Hunt. Twp.<br>Westmoreland County | Yes | Yes | -NA- | | | | |
| #2966BSM76<br>L. W. Overly<br>Mt. Pleasant Twp.<br>Westmoreland County | Yes | Yes | -NA- | | | | |
| #3470BSM2<br>William Piccolomini<br>Mt. Pleasant Twp.<br>Westmoreland County | Yes | Yes | -NA- | | | | |
| #3471BSM1<br>Walter Green, Inc.<br>Mt. Pleasant Twp.<br>Westmoreland County | Yes | Yes | -NA- | | | | |
| #3471BSM8<br>Pert Sales, Inc.<br>Mt. Pleasant Twp.<br>Westmoreland County | Yes | Yes | -NA- | | | | |

NOT STARTED

## MINE DRAINAGE STATUS - STRIP MINES
## MONONGAHELA RIVER BASIN
## (PERMIT ISSUED BUT NOT STARTED)

| Name and Location | Treatment Required | Does Treatment Meet Standards? | Enforcement Action | Project Status | | | |
|---|---|---|---|---|---|---|---|
| | | | | Schedule | Final Plans | Under Construction | Plant in Operation or Discharge Abated |
| #3366BSM66<br>Sanner Brothers<br>Elk Lick<br>Somerset County | Yes | Yes | -NA- | | | | |
| #3366BSM88<br>Rankin Coal Company<br>Somerset Twp.<br>Somerset County | Yes | Yes | -NA- | | | | |
| #2969BSM21<br>Soberdash Coal & Coke<br>S. Union, Georges, German<br>Fayette County | Yes | Yes | -NA- | | | | |
| #3371BSM10<br>Whyel Coal Company<br>S. Union Twp.<br>Fayette County | Yes | Yes | -NA- | | | | |
| #2967BSM42<br>A. V. Albright<br>Springhill Twp.<br>Fayette County | Yes | Yes | -NA- | | | | |
| #3371BSM11<br>Bartoni Coal Co.<br>Springhill Twp.<br>Fayette County | Yes | Yes | -NA- | | | | |
| #3371BSM19<br>Buncic Coal Company<br>Springhill Twp.<br>Fayette County | Yes | Yes | -NA- | | | | |
| #2967BSM54<br>Soberdash Coal & Coke<br>Upper Tyrone Twp.<br>Fayette County | Yes | Yes | -NA- | | | | |

NOT STARTED

## MINE DRAINAGE STATUS - STRIP MINES
## MONONGAHELA RIVER BASIN
## (PERMIT ISSUED BUT NOT STARTED)

| Name and Location | Treatment Required | Does Treatment Meet Standards? | Enforcement Action | Project Status | | | |
|---|---|---|---|---|---|---|---|
| | | | | Schedule | Final Plans | Under Construction | Plant in Operation or Discharge Abated |
| #3471BSM16<br>William Piccolomini<br>Mt. Pleasant Twp.<br>Westmoreland County | Yes | Yes | -NA- | | | | |
| #2968BSM11<br>Valley Coal Company<br>Dunkard Twp.<br>Greene County | Yes | Yes | -NA- | | | | |
| #3470BSM18<br>S. & P. Coal Company<br>Rostraver Twp.<br>Westmoreland County | Yes | Yes | -NA- | | | | |
| #2969BSM14<br>S & S Coal Company<br>Bullskin Twp.<br>Fayette County | Yes | Yes | -NA- | | | | |
| #3371BSM14<br>Solomon & Teslovich<br>Franklin Twp.<br>Fayette County | Yes | Yes | -NA- | | | | |
| #2966BSM38<br>Palmerino Co., Inc.<br>Georges, German, S. Union<br>Fayette County | Yes | Yes | -NA- | | | | |
| #2967BSM24<br>Reese Coal Company<br>Georges Twp.<br>Fayette County | Yes | Yes | -NA- | | | | |
| #2967BSM17<br>S & A Construction<br>Georges Twp.<br>Fayette County | Yes | Yes | -NA- | | | | |

NOT STARTED

## MINE DRAINAGE STATUS - STRIP MINES
## MONONGAHELA RIVER BASIN
## (PERMIT ISSUED BUT NOT STARTED)

| Name and Location | Treatment Required | Does Treatment Meet Standards? | Enforcement Action | Project Status | | | |
|---|---|---|---|---|---|---|---|
| | | | | Schedule | Final Plans | Under Construction | Plant in Operation or Discharge Abated |
| #2669BSM8<br>Dean E. Redd<br>Fallowfield Twp.<br>Washington County | Yes | Yes | -NA- | | | | |
| #3270BSM15<br>Twilight Industries<br>Fallowfield Twp.<br>Washington County | Yes | Yes | -NA- | | | | |
| #3271BSM2<br>Bill Stefan<br>Fallowfield Twp.<br>Washington County | Yes | Yes | -NA- | | | | |
| #2969BSM35<br>Jane Coal Co., Inc.<br>Cumberland Twp.<br>Greene County | Yes | Yes | -NA- | | | | |
| #3270BSM14<br>Jane Coal Co., Inc.<br>Cumberland Twp.<br>Greene County | Yes | Yes | -NA- | | | | |
| #3271BSM5<br>Pontorero & Sons<br>Cumberland Twp.<br>Greene County | Yes | Yes | -NA- | | | | |
| #3271BSM13<br>Twilight Industries<br>Cumberland Twp.<br>Greene County | Yes | Yes | -NA- | | | | |
| #2969BSM8<br>Genovese Coal Co.<br>Dunkard Twp.<br>Greene County | Yes | Yes | -NA- | | | | |

NOT STARTED

## MINE DRAINAGE STATUS - STRIP MINES
## MONONGAHELA RIVER BASIN
## (PERMIT ISSUED BUT NOT STARTED)

| Name and Location | Treatment Required | Does Treatment Meet Standards? | Enforcement Action | Project Status: Schedule | Project Status: Final Plans | Project Status: Under Construction | Project Status: Plant in Operation or Discharge Abated |
|---|---|---|---|---|---|---|---|
| #2669BSM15<br>Richard Gorr<br>Elizabeth Twp.<br>Allegheny County | Yes | Yes | -NA- | | | | |
| #2667BSM6<br>Michael Rostosky<br>Forward Twp.<br>Allegheny County | Yes | Yes | -NA- | | | | |
| #2370BSM10<br>Frank Kowalski<br>Franklin Twp.<br>Washington Twp.<br>Westmoreland County | Yes | Yes | -NA- | | | | |
| #3470BSM21<br>Adam Eidmiller, Inc.<br>Hempfield Twp.<br>Westmoreland County | Yes | Yes | -NA- | | | | |
| #3470BSM22<br>Adam Eidemiller<br>Hempfield Twp.<br>Westmoreland County | Yes | Yes | -NA- | | | | |
| #2966BSM79<br>John E. Grillo<br>Penn Twp.<br>Westmoreland County | Yes | Yes | -NA- | | | | |
| #2966BSM15<br>S & K Construction<br>Sewickley Township<br>Westmoreland County | Yes | Yes | -NA- | | | | |

**NOT STARTED**

## MINE DRAINAGE STATUS - STRIP MINES
## MONONGAHELA RIVER BASIN
## (PERMIT ISSUED BUT NOT STARTED)

| Name and Location | Treatment Required | Does Treatment Meet Standards? | Enforcement Action | Project Status |  |  |  |
|---|---|---|---|---|---|---|---|
|  |  |  |  | Schedule | Final Plans | Under Construction | Plant in Operation or Discharge Abated |
| #3370BSM15<br>William Piccolomini<br>Washington Twp.<br>Fayette County | Yes | Yes | -NA- |  |  |  |  |
| #3366BSM58<br>William Schmidt Coal Co.<br>Brothersvalley Twp.<br>Somerset County | Yes | Yes | -NA- |  |  |  |  |
| #3366BSM81<br>Penn Pocahontas Coal Co.<br>Brothersvalley Twp.<br>Somerset County | Yes | Yes | -NA- |  |  |  |  |
| #3366BSM96<br>William E. Scurfield<br>Brothersvalley Twp.<br>Somerset County | Yes | Yes | -NA- |  |  |  |  |
| #4071BSM3<br>Croner, Inc.<br>Brothersvalley Twp.<br>Somerset County | Yes | Yes | -NA- |  |  |  |  |
| #3366BSM72<br>Sanner Brothers<br>Summit Twp.<br>Somerset County | Yes | Yes | -NA- |  |  |  |  |
| #3367BSM2<br>Robert W. Decker<br>Summit Twp.<br>Somerset County | Yes | Yes | -NA- |  |  |  |  |

NOT STARTED

## MINE DRAINAGE STATUS - STRIP MINES
### MONONGAHELA RIVER BASIN
### (PERMIT ISSUED BUT NOT STARTED)

| Name and Location | Treatment Required | Does Treatment Meet Standards? | Enforcement Action | Project Status | | | |
|---|---|---|---|---|---|---|---|
| | | | | Schedule | Final Plans | Under Construction | Plant in Operation or Discharge Abated |
| #2666BSM7<br>Fred Fiore<br>Baldwin Borough<br>Allegheny County | Yes | Yes | -NA- | | | | |
| #2666BSM17<br>Twilight Industries<br>Baldwin Borough<br>Allegheny County | Yes | Yes | -NA- | | | | |
| #2669BSM13<br>Twilight Industries<br>Baldwin Borough<br>Allegheny County | Yes | Yes | -NA- | | | | |
| #2667BSM10<br>Twilight Industries<br>Jefferson Twp.<br>Allegheny County | Yes | Yes | -NA- | | | | |
| #2666BSM6<br>Twilight Industries<br>Snowden Township<br>Allegheny County | Yes | Yes | -NA- | | | | |
| #3270BSM10<br>Twilight Industries<br>Carroll Twp.<br>Washington County | Yes | Yes | -NA- | | | | |
| #3271BSM1<br>Mineral Excavating<br>Union Township<br>Washington County | Yes | Yes | -NA- | | | | |
| #3271BSM3<br>J. J. Coal Corporation<br>Somerset Twp.<br>Washington County | Yes | Yes | -NA- | | | | |

**NOT STARTED**

## MINE DRAINAGE STATUS - STRIP MINES
## MONONGAHELA RIVER BASIN
## (PERMITS ISSUED BUT NOT STARTED)

| Name and Location | Treatment Required | Does Treatment Meet Standards? | Enforcement Action | Project Status | | | |
|---|---|---|---|---|---|---|---|
| | | | | Schedule | Final Plans | Under Construction | Plant in Operation or Discharge Abated |
| #3371BSM9<br>Solomon & Teslovich<br>German Twp.<br>Gayette County | Yes | Yes | -NA- | | | | |
| #3371BSM15<br>The Rondell Company<br>German, Nicholson Twp.<br>Fayette County | Yes | Yes | -NA- | | | | |
| #3371BSM16<br>Joseph E. Orell<br>German Twp.<br>Fayette County | Yes | Yes | -NA- | | | | |
| #3371BSM18<br>Jane Coal Co., Inc.<br>German Twp.<br>Fayette County | Yes | Yes | -NA- | | | | |
| #2966BSM47<br>S & A Constr. Co.<br>Lower Tyrone Twp.<br>Fayette County | Yes | Yes | -NA- | | | | |
| #2968BSM37<br>Soberdash Coal & Coke<br>Lower Tyrone Twp.<br>Fayette County | Yes | Yes | -NA- | | | | |
| #3371BSM20<br>Penna. Mineral Co.<br>Luzerne Twp.<br>Fayette County | Yes | Yes | -NA- | | | | |
| #3370BSM19<br>Pontorero & Sons Coal<br>Nicholson Twp.<br>Fayette County | Yes | Yes | -NA- | | | | |

NOT STARTED

# MINE DRAINAGE STATUS - STRIP MINES
## MONONGAHELA RIVER BASIN
## (PERMIT ISSUED BUT NOT STARTED)

| Name and Location | Treatment Required | Does Treatment Meet Standards? | Enforcement Action | Project Status | | | |
|---|---|---|---|---|---|---|---|
| | | | | Schedule | Final Plans | Under Construction | Plant in Operation or Discharge Abated |
| #3370BSM26<br>P & R Coal Company<br>Nicholson Twp.<br>Fayette County | Yes | Yes | -NA- | | | | |
| #3371BSM5<br>Soberdash Coal & Coke<br>Nicholson Twp.<br>Fayette County | Yes | Yes | -NA- | | | | |
| #2966BSM115<br>William Piccolomini<br>N. Union, Franklin Twp.<br>Fayette County | Yes | Yes | -NA- | | | | |
| #2967BSM34<br>Pontorero & Sons Coal<br>N. Union, Dunbar Twp.<br>Fayette County | Yes | Yes | -NA- | | | | |
| #2967BSM49<br>Soberdash Coal & Coke<br>N. Union Twp.<br>Fayette County | Yes | Yes | -NA- | | | | |
| #2968BSM8<br>Soberdash Coal & Coke<br>N. Union Twp.<br>Fayette County | Yes | Yes | -NA- | | | | |
| #3370BSM21<br>Paul V. Mahoney<br>N. Union Twp.<br>Fayette County | Yes | Yes | -NA- | | | | |
| #2967BSM44<br>William Tedesco<br>Saltlick Twp.<br>Fayette County | Yes | Yes | -NA- | | | | |

NOT STARTED

# MINE DRAINAGE STATUS - STRIP MINES
## MONONGAHELA RIVER BASIN
## (PERMIT ISSUED BUT NOT STARTED)

| Name and Location | Treatment Required | Does Treatment Meet Standards? | Enforcement Action | Project Status: Schedule | Project Status: Final Plans | Project Status: Under Construction | Project Status: Plant in Operation or Discharge Abated |
|---|---|---|---|---|---|---|---|
| #3371BSM3<br>Whyel Coal Company<br>Georges, S. Union Twp.<br>Fayette County | Yes | Yes | -NA- | | | | |
| #3371BSM7<br>Soberdash Coal & Coke<br>Georges Twp.<br>Fayette County | Yes | Yes | -NA- | | | | |
| #3371BSM8<br>Kelley, Enterprises, Inc.<br>Georges Twp.<br>Fayette County | Yes | Yes | -NA- | | | | |
| #2966BSM89<br>Coolspring Constr. Co.<br>Menallen Twp.<br>Fayette County | Yes | Yes | -NA- | | | | |
| #2967BSM60<br>William Piccolomini<br>Menallen Twp.<br>Fayette County | Yes | Yes | -NA- | | | | |
| #2966BSM70<br>United Coal Company<br>German Twp.<br>Fayette County | Yes | Yes | -NA- | | | | |
| #2969BSM4<br>Soberdash Coal & Coke<br>German Twp.<br>Fayette County | Yes | Yes | -NA- | | | | |
| #3370BSM1<br>Soberdash Coal & Coke<br>German Twp.<br>Fayette County | Yes | Yes | -NA- | | | | |

NOT STARTED

# MINE DRAINAGE STATUS - STRIP MINES
MONONGAHELA RIVER BASIN
(PERMIT ISSUED BUT NOT STARTED)

| Name and Location | Treatment Required | Does Treatment Meet Standards? | Enforcement Action | Project Status | | | |
|---|---|---|---|---|---|---|---|
| | | | | Schedule | Final Plans | Under Construction | Plant in Operation or Discharge Abated |
| #2967BSM26<br>Swaney & Swaney Coal<br>Redstone Twp.<br>Fayette County | Yes | Yes | -NA- | | | | |
| #2967BSM55<br>Soberdash Coal & Coke<br>S. Union Twp.<br>Fayette County | Yes | Yes | -NA- | | | | |
| #2968BSM9<br>Soberdash Coal & Coke<br>S. Union Twp.<br>Fayette County | Yes | Yes | -NA- | | | | |
| #2967BSM59<br>Russell I. Jenkins<br>Saltlick Twp.<br>Fayette County | Yes | Yes | -NA- | | | | |
| #2967BSM61<br>William E. Tedesco<br>Saltlick Twp.<br>Fayette County | Yes | Yes | -NA- | | | | |
| #2968BSM21<br>Somerset Coal &<br>Excavating Company<br>Saltlick Twp.<br>Fayette County | Yes | Yes | -NA- | | | | |
| #3370BSM8<br>William K. Tedesco<br>Saltlick Twp.<br>Fayette County | Yes | Yes | -NA- | | | | |
| #3371BSM6<br>Purco Coal Co., Inc.<br>Saltlick Twp.<br>Fayette County | Yes | Yes | -NA- | | | | |

NOT STARTED

## MINE DRAINAGE STATUS - STRIP MINES
## MONONGAHELA RIVER BASIN
## (PERMIT ISSUED BUT NOT STARTED)

| Name and Location | Treatment Required | Does Treatment Meet Standards? | Enforcement Action | Project Status | | | |
|---|---|---|---|---|---|---|---|
| | | | | Schedule | Final Plans | Under Construction | Plant in Operation or Discharge Abated |
| #3270BSM7<br>Ford & Gaskill<br>Dunkard Twp.<br>Greene County | Yes | Yes | -NA- | | | | |
| #3271BSM16<br>Genovese Coal Company<br>Dunkard Twp.<br>Greene County | Yes | Yes | -NA- | | | | |
| #3271BSM19<br>King Knob Coal Company<br>Dunkard Twp.<br>Greene County | Yes | Yes | -NA- | | | | |
| #3271BSM4<br>Twilight Industries, Inc.<br>Dunkard Twp.<br>Greene Twp.<br>Greene County | Yes | Yes | -NA- | | | | |
| #3270BSM2<br>Stromick Coal Company<br>Monongahela Twp.<br>Greene County | Yes | Yes | -NA- | | | | |
| #3271BSM6<br>Sang Coal Company<br>Monongahela Twp.<br>Greene County | Yes | Yes | -NA- | | | | |
| #3271BSM7<br>Twilight Industries<br>Monongahela Twp.<br>Greene County | Yes | Yes | -NA- | | | | |

## MINE DRAINAGE ABATEMENT PROJECTS

## PENNSYLVANIA LAND AND WATER CONSERVATION AND RECLAMATION FUND

A. Completed Projects

| **PROJECT** NUMBER AND LOCATION | PROJECT DESCRIPTION | ENGINEER AND/OR CONTRACTOR | ESTIMATED COST | STATUS OF PROGRESS |
|---|---|---|---|---|
| SL 118<br>Shaw Complex<br>Somerset County | Abatement and Reclamation Preliminary Survey and mapping completed. | L. Robert Kimball | 15,000.00 | Completed |
| SL 118-1<br>Shaw Complex<br>Somerset County | Abatement and Reclamation (Hay Property) (8 acres approximately) | Sanner Bros. Coal Co. | 21,090.00 | Contract awarded November 12, 1969. Work started November 24, 1969. 98% completed. |
| SL 118-2<br>Shaw Mine Complex<br>Somerset County | Abatement and Reclamation - Summit and Elklick Townships. Project completed during December 1970. | M. F. Fetterolf Coal Company, Inc. | 300,000.00 | Completed |
| SL 138-2<br>Cucumber Run<br>Fayette County | Subsurface Exploration Contract approved on January 13, 1971. Completed during May 1971. | Pennsylvania Drilling Company | 7,667.00 | 6,842.50 Completed |
| SL 141<br>Redstone Creek<br>N. Union Township<br>Fayette County | Pollution Abatement | Fayette Engineering Co. | 9,500.00 | Contract approved on June 27, 1969. Completed |
| SL 141-1<br>South Union Township<br>Fayette County | Strip Mine Reclamation Proposals were opened on July 30, 1970. Contract approved on September 25, 1970. Work started on Oct. 28, 1970. Project completed May 1971. | L & J Equipment Company | 78,257.00 | 78,257.00 Completed |

| PROJECT NUMBER AND LOCATION | PROJECT DESCRIPTION | ENGINEER AND/OR CONTRACTOR | ESTIMATED COST | STATUS OF PROGRESS |
|---|---|---|---|---|
| SL 142<br>Pigeon Creek<br>Carroll Township<br>Washington County | Design | Department of Environmental Resources | | |
| SL 142-1<br>Pigeon Creek<br>Carroll Township<br>Washington County | Construction of a Mine Drainage Treatment Plant for the control and treatment of acid mine drainage polluting the water of Pigeon Creek. Work started Oct. 17, 1969. Completed. | Alex E. Paris Contracting Company | 46,182.11 | 53,187.48 Completed |
| | Change Order approved to provide reinforced concrete seal in bottom of creek bed; and providing access road to work area. | | Change order #1<br>4,945.00 | |
| | Additional Work. | | Change order #2<br>2,060.37 | |
| B. Active Projects | | | | |
| SL 118-2A<br>Shaw Mining Complex<br>Somerset County | Abatement and Reclamation | M. F. Fetterolf Coal Company, Inc. | 750,000.00 | Contract approved on December 17, 1970. |
| SL 118-4<br>Shaw Complex<br>Somerset County | Abate or minimize water pollution of the Casselman River by rotary drilling, injection of dry fly ash, injection of fly ash slurry, and injection of cement fly ash slurry | | | To be advertised shortly. |
| SL 118-5<br>Shaw Complex<br>Somerset County | Installation of Deep Mine Seals | | | To be advertised shortly. |

| PROJECT NUMBER AND LOCATION | PROJECT DESCRIPTION | ENGINEER AND/OR CONTRACTOR | ESTIMATED COST | STATUS OF PROGRESS |
|---|---|---|---|---|
| SL 138<br>Cucumber Run<br>Ohiopyle State Park<br>Fayette County | Design of Mine Seals above Cucumber Falls | E. D'Appolonia | 25,000.00 | Contract approved on June 27, 1969.<br>Review of plans and specifications for sealing King Mine.<br>Abatement plans being reviewed for watershed. |
| SL 138-1<br>Cucumber Run<br>Fayette County | Exploratory Excavation | S. T. Mitchell | 14,895.00 | Contract approved on January 13, 1971; 100% completed. |
| | | | Change Order #1<br>10,000.00 | |
| | | | Change Order #2<br>14,655.00 | |
| SL 146-1<br>Turtle Creek<br>Westmoreland County | Investigation of the Del-Ex mine drainage discharge and design and supervision of construction of abatement measures | George Wright (Project Engineer) | 32,700.00 | Service Contract approved on November 18, 1970. |
| SL 146-2<br>Turtle Creek Valley<br>Allegheny County | Borough of North Braddock Core boring and pressure testing | | | Plans and Specifications to be completed shortly. |
| SL 157<br>Piersons Run<br>Allegheny County | Pollution Abatement Study | General Analytics, Inc. | 15,258.00 | Service Contract approved. Final report being prepared. |
| SL 157-1<br>Piersons Run<br>Allegheny County | Boyce Park<br>Lime Treatment Plant | Department of Environmental Resources | | Plans and Specifications being prepared. |

| PROJECT NUMBER AND LOCATION | PROJECT DESCRIPTION | ENGINEER AND/OR CONTRACTOR | ESTIMATED COST | STATUS OF PROGRESS |
|---|---|---|---|---|
| SL 178<br>Manallen Township<br>Fayette County | Restoration of Strip Mine Areas | Department of Environmental Resources | | Plans and Specifications being prepared. |
| C. Planned Projects | | | | |
| SL 146-3<br>Turtle Creek<br>Westmoreland County | Construction of abatement facilities for SL-146 pending acquisition of leases and filing of liens | | | |

# MINE DRAINAGE ABATEMENT PROJECTS

## PENNSYLVANIA ABANDONED COAL MINE SERVICES PROGRAM[1] (see footnote)

**ALLEGHENY COUNTY**

| PROJECT NUMBER | LOCATION | PROJECT STATUS | COST |
|---|---|---|---|
| BD - 161 | Forward Township | Completed 11/8/65 | $ 3,203.10 |
| BD - 208 | Forward Township | Completed 6/6/67 | $ 2,963.68 |
| BD - 316 | Penn Hills Township | Completed 12/16/69 | $12,529.60 |
| BD - 329 | Churchill Borough | Completed 10/21/69 | $ 1,340.14 |
| BD - 351 | Churchill Borough | Completed 1/30/70 | $ 968.82 |
| BD - 413 | Forward Township | Completed 1/15/71 | $ 157.36 |
| BD - 415 | Elizabeth Township | Completed 3/23/71 | $ 2,261.02 |
| B - 134 | Elizabeth Township | Started 4/28/70<br>Still in Progress | $ 3,342.00 |
| B - 152 | South Park Township | Completed 3/11/71 | $ 3,990.00 |
| B - 158 | Elizabeth Township | Completed 5/21/71 | $ 8,170.00 |
| B - 174 | Baldwin Township | Completed 6/30/71 | $ 1,790.00 |
| B - 179 | City of Pittsburgh | Bids opened 7/13/71 | |

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[1] Funds for the Abandoned Coal Mine Services Program are budgeted by the Office of Engineering and Construction, Bureau of Planning and Development Research (DER) as part of the State of Pennsylvania General Appropriations.

## MINE DRAINAGE ABATEMENT PROJECTS

## PENNSYLVANIA ABANDONED COAL MINE SERVICES PROGRAM

### FAYETTE COUNTY

| PROJECT NUMBER | LOCATION | PROJECT STATUS | COST |
|---|---|---|---|
| BD - 191 | Georges Township | Completed 7/15/66 | $ 67.72 |
| BD - 237 | Brownsville Borough | Completed 8/11/67 | $ 1,624.93 |
| BD - 281 | German Township | Completed 8/22/68 | $ 1,147.66 |
| BD - 292 | Brownsville Borough | Completed 4/22/69 | $ 2,187.67 |
| BD - 324 | Nicholson Township | Completed 8/8/69 | $ 228.18 |
| BD - 357 | German Township | Completed 2/24/70 | $ 460.86 |
| BD - 368 | Georges Township | Completed 4/28/70 | $ 335.32 |
| BD - 374 | Upper Tyrone Township | Completed 6/2/70 | $ 720.94 |
| BD - 381 | German Township | Completed 8/11/70 | $ 1,672.87 |
| BD - 383 | Brownsville Borough | Completed 8/25/70 | $ 1,188.20 |
| BD - 452 | Georges Township | Completed 5/7/71 | $ 53.44 |
| B - 156 | Franklin Township | Work in Progress | $ 9,435.50 |

### SOMERSET COUNTY

| | | | |
|---|---|---|---|
| BD - 296 | Elklick Township | Completed 11/18/68 | $ 401.43 |

# MINE DRAINAGE ABATEMENT PROJECTS

## PENNSYLVANIA ABANDONED COAL MINE SERVICES PROGRAM

### WESTMORELAND COUNTY

| PROJECT NUMBER | LOCATION | PROJECT STATUS | COST |
|---|---|---|---|
| BD - 96-A | Penn Township | Completed 8/6/63 | $ 384.05 |
| BD - 380 | Mt. Pleasant Township | Completed 7/14/70 | $ 404.16 |
| B - 139 | North Huntingdon Township | Completed 9/23/70 | $23,379.10 |

W. Lyon

MR. LYON: Now, all I will do is very quickly summarize some of the highlights of our report. It provides information on the current status of water quality management in the Pennsylvania portion of the Monongahela River Basin and updates information presented at the 1963 Enforcement Conference called under the provisions of the Federal Water Pollution Control Act.

In summary, the quality of the Monongahela River is improving. It is not as acid and not as oily as it used to be. Fish are present in the lower reaches, and some tributaries have been stocked with trout for the first time in memory. A considerable portion of the improvement is due to better waste treatment at mines, industries, and communities.

And I might go back to page 16 and just highlight the fact that the major source of water pollution on the Monongahela River Basin is mine drainage from abandoned coal mines. And on the cover of our report we show the Pennsylvania portion of the watershed, and we show in heavy ink the streams that are affected by mine drainage both from active and abandoned mines, but these days primarily from abandoned mines.

If mine drainage pollution was suddenly stopped, the Monongahela River would support fish life from the State line to the mouth and most tributaries would also support fish life. When the mine drainage was reduced on the headwaters of Peters Creek, fish returned in the Finleyville area despite raw sewage discharges. This is not to say that we sanctioned them, but this is what happened. The West Pike Run was relieved of its acid burden and stocked with trout. Miles of the Youghiogheny River will become trout water when abandoned mine drainage projects on the watershed being undertaken by the State are completed. Both Fayette and Westmoreland Counties are planning to use the Youghiogheny for water supply.

If mine drainage pollution were abated, communities would try harder to treat their sewage because sludge banks, gray water, and bacteria would impair the uses of the river. Industries would operate more carefully because a fish kill could result from illegal dumping.

And let me also mention that industries in the watershed in Pennsylvania use about 1.2 billion gallons, which is just about the same amount of water that the city of New York uses, and public water supply is about 100 million gallons.

Pollution, then, from abandoned coal mine drainage is the most serious water pollution control problem in the Pennsylvania portion of the basin. Abatement of abandoned mine drainage pollution has lagged behind other pollution abatement. The acid condition of the streams and a depressed economic condition in the coal mining regions have discouraged pollution abatement. The active mines are now treating their wastes but many small municipalities, particularly those located on acid streams, are not, despite court orders. And we will follow up on those court orders.

At this time, 60 percent of the municipalities in the State that discharge to acid streams do not treat, and many are not taking satisfactory steps to provide treatment. In contrast, on alkaline streams, 85 percent of the municipalities in the State provide treatment, and most of the remaining municipalities are taking satisfactory steps toward pollution abatement. This same relationship holds for the Monongahela River Basin. The untreated municipal discharges to acid streams make up nearly 90 percent of the untreated municipal discharges in the Pennsylvania portion of the basin. Communities generally will treat their sewage if they can see an improvement of conditions. This improvement can be difficult to demonstrate in acid streams.

Without significant abandoned mine drainage pollution abatement on the Monongahela watershed, we do not expect to see a further marked improvement in the quality and usefulness of the river. The adverse effects of mine

W. Lyon

drainage will still be present, and river conditions will make it more difficult to detect the effects of other discharges.

Pennsylvania is under way in its statewide program to abate pollution from abandoned coal mining operations. One hundred fifty million dollars of the State's $500 million Land and Water Conservation and Reclamation Fund have been allocated for this purpose, and the citizens of this State voted for that bond issue overwhelmingly. This allocation represents a significant start in solving the problem but help is needed. Supplemental Federal funds are needed immediately to accelerate the program, and I don't mean pilot projects. Since the mine drainage pollution problem is interstate in nature, funds are needed in other States as well to aid in solving this problem. Since 1963, there have been Federal studies of the abandoned mine drainage problem but very little corrective action.

Pennsylvania has taken some corrective action, and in the back of our book we list the specific projects that have been carried out with bond issue money.

The public expectation of an enforcement conference is that it will result in pollution being abated. The 1963 session of this conference recognized that the solution to the water quality problems of the Monongahela River Basin could not be achieved through enforcement alone. As a matter of fact, it was recognized that enforcement would have a limited role in solving the abandoned mine drainage problem.

Pennsylvania is working to solve the water quality problems of the Monongahela River Basin. This is evidenced by:

1. 85 percent of the 245 sewerage cases in the basin being in compliance with standards or making satisfactory progress toward compliance.

2. The offering of approximately $5.8 million in State financial aid to construct 20 sewage treatment plants since 1968.

3. The providing of $17.5 million in State grants for the operation and maintenance of sewage treatment plants in Monongahela Basin counties since 1963.

4. 93 percent of the 193 industrial plants being in compliance or making satisfactory progress toward compliance.

5. 97 percent of the 147 active coal mines in the basin meeting State effluent standards.

6. The spending of approximately $1.5 million of State funds on 33 abandoned mine drainage pollution abatement projects.

And, of course, all of these projects and the municipalities and the industries together with their compliance status are listed in our report.

These State efforts will continue, but Federal financial participation is needed in specific abandoned mine drainage pollution projects selected on a priority basis to solve the overwhelming pollution problem of the basin.

So far, unlike what was done in the Susquehanna, EPA, 8 years later, has not recommended a specific remedial program. These conferees recommended such a program in 1963.

Pennsylvania has 33 abandoned mine drainage projects. As far as I know, the Federal Government has none.

Pennsylvanians, since 1963, have spent $150 million cleaning up pollution in the Monongahela Basin. This breaks down something like this: about $65 million have been spent by local government; about $22 million by the State Government; and $63 million by industry, $57 million of that by the non-mining industry and about $6 million by the mining industry, in treating this drainage. In addition, we have received $30 million from the Federal Government for sewage treatment plant construction.

But except for the participation in the work of this committee, as far as I know, there has been no Federal money spent on the very serious and primary problem of pollution from abandoned mines.

Frankly, I am concerned about the posture of EPA riding into town like Don Quixote on a white charger, and it is an interesting spectacle, but frankly I am afraid that too many people will be led to think that this will solve the problem. Frankly, I don't think it will. I am terribly concerned about some of the publicity that is associated with this conference, and I quote from a letter from Mr. Silverman, where he says: "Dear Environmentalist: I want to remind you that Mr. Ruckelshaus has reconvened this conference ..." -- and then he talks about the place and the time of the conference and that the public is invited, and then he says: "The purpose of this meeting is to allow the conferee to examine its findings and enable the 3 States, West Virginia, Maryland, Pennsylvania, which have active and inactive mines contributing to the Monongahela River pollution, to adopt a specific abatement program to deal with the problem."

Well, heck, that is what we agreed to do 8 years ago, and we know darned well that that isn't going to happen at this meeting. So why try to tell the public that it will? This is the kind of concern that we have.

Frankly, our program in the Monongahela, irrespective of the conference, is no different in the Monongahela than it is anywhere else, and 8 years later we still have pollution from abandoned mines.

What Pennsylvania is doing is certainly not enough, but at least we are doing something. Let's get away from the ceremonial enforcement ritual and deal with the realities of the situation. To clean up pollution from abandoned mines takes men and money. Let's have more of that and fewer press releases and fewer press conferences.

In the Susquehanna, we have had no enforcement conference and we have had a lot more help from the Federal Government than in the Monongahela where we have had a Federal enforcement conference.

Thank you.

MR. STEIN: Are there any comments or questions?

MR. COOK: Mr. Lyon, I think you said that, if you removed the acid mine drainage from some of the streams that are colored in dark lines here on the cover of the book, you could stock trout, that these are trout waters -- they would be if it weren't for mine drainage. Is that correct?

MR. LYON: I said some of them would, and some of them already have recovered where things have been done, yes.

I can go back and -- I said West Pike Run was relieved of its acid burden and stocked with trout. I said that miles of the Youghiogheny River will become trout water when the abandoned mine drainage projects on the watershed being undertaken by the State are completed.

MR. COOK: Do those projects include erosion control and restoration of stream beds?

MR. LYON: I would assume that if it is necessary that they will, yes.

MR. COOK: In other words, you don't feel that there is a need for a pilot project to determine what the cost would be in stream restoration to supply or to return that stream to a suitable habitat for trout or other desirable species?

MR. LYON: I don't think, Grover, that a pilot project in any one stream will tell us what the cost will be in another stream, frankly. I think we can figure out -- there are plenty of engineers around here who can figure out how much it will take, how much it will cost to remove sediment from a stream. And you can't tell from one stream what it is going to cost in another stream. You have to look at all of the streams.

MR. COOK: That is all I have.

MR. STEIN: I have several comments. I guess things never change, and aside from personal style I think we are getting very close. But it never fails that the State feels that part of this enforcement ritual means that the State has to attack the Federal Government. I guess if we were doing our job, both State and Federal, we wouldn't be here.

But I have a question on just the last point. If Pennsylvania points out that it has spent approximately $1.5 million on 33 abandoned mine drainage pollution abatement projects, what is proposed is a pilot operation that is going to cost $5 million? That is about 4 times as much as they spent on the 33 operations.

Now I would suggest this. With that disparity in these figures, is what we need a pilot project, or is what we need a priority? Because if we had a priority and we expended say $5 million, that would be 4 times as much as Pennsylvania has already spent, and we would be able to do that commensurate work. The problem that I have is this: In dealing with these terms of money or this magnitude of funds, is a pilot project needed, or can the engineers devise a priority system so we can put that kind of money toward getting started with the cleanup and get the maximum amount of results? After looking at these figures, this is just a question I raise because it comes up and hits you in the face. If we spent $1.5 million of State funds possibly over the last decade, on a project that we are now coming up with one pilot project costing about $5 million, we have to really, really look at that.

I am not looking necessarily for an answer now, but I think when we come up with our recommendations, we should examine that very carefully.

MR. LYON: Well, let me briefly comment. I think from a public policy point of view, it would be a lot better to spend the $5 million, if that is what we need -- I am not sure we need that much -- on establishing a priority list the way EPA has done in the Susquehanna. So we can then go to Congress and say: "This is what you will get if you spend so much; this is what you will get if you spend twice that much."

We frankly think that the time for pilot project is long gone. We know how to do these things, and we know what to do. Our old Department of Mines -- and Mr. Maneval is here in the audience -- have extensive experience in this kind of work, and we don't need any more demonstration and pilot projects. What we need is something Congress can use to make an appropriation. To my knowledge, EPA has never once recommended to Congress that we get down to nuts and bolts and have a major project -- a major program that goes beyond the research and demonstration stage to clean up what you call the most serious pollution problem in the whole country in the mine drainage field in the Monongahela.

The point is: When is the Federal Government going to move and give Pennsylvania some assistance? Pennsylvania has voted money -- taxpayers' money -- to participate in this. When do we get some Federal help?

MR. STEIN: Well, whether I really think we can possibly move forward a little faster without those self-serving statements, I will concede Pennsylvania is a great State, keystone to the whole problem.

Let me look at these two points, because I think you do have a point that I would like to ask the conferees to consider. The Federal proposal was: within 3 months select a pilot project to determine costs and feasibility of reclaiming within a complete watershed, streams damaged by sedimentation from mine drainage. And the second thing: within 6 months prepare a plan -- and that "plan" bothers me -- for setting priorities for the abatement of mine drainage from inactive mines.

My question is can't we, within 3 months, begin getting at least the top priority operations on which we can move? Now, I think if the assumptions are correct in the report -- and let me just put this forward -- that we know where the major sources are, if we hit those, we are going to get the greatest return.

I think it is like everything else. The first few projects you are going to pick in terms of priority may very well be the obvious ones, and the ones that are going to pan out and be the least are going to be obvious. It is the ones in between which may create a problem of what the priority is. But if we are going to make a start on this program, wouldn't it be feasible within 3 months to pick out the 5 or 6 or 10 or whatever-have-you projects with time estimates and funding estimates which are going to give us the greatest return?

Don't we know enough about the nature of this so that we can get started now, and get this group not to work up necessarily a plan for setting priorities -- because I think with the work on the Susquehanna and other rivers, the committee can do this perhaps at its first meeting -- but within a few months, have recommendations as to definite priorities on moving on the cleanup?

MR. LYON: Well, I think I commented on this point before. The job of taking the data that is available -- and, again, I think that a good job has been done in collecting this data -- is a staff job. It was a staff job on the Susquehanna. What you have to do is take the costs, and you take the benefits in terms of stream improvement, and you try to pick out the projects where you get the most benefits out of the least dollars.

This is a purely engineering job that people can do -- people in EPA have done it, as I said before, for the

Susquehanna. I think if you put enough people on it, the answer is yes, it can be done in 3 months. I think it can be done in 3 months. I don't think a committee can do it. A committee can establish policy guidelines for the staff to follow, but the committee itself cannot do it. It is a staff job. And this is why we have repeatedly asked in the committee meetings that this precisely be done, and Mr. Horton wrote his letter 2 years ago.

MR. STEIN: Let me again make clear what I am asking the conferees to do. I wonder whether we could come up with a recommendation which would lead to the conferees being presented, within 3 months, the top priority projects for the cleanup of the mine drainage in the Monongahela River Basin.

If this means getting staff to follow certain guidelines and getting a committee to establish the guidelines, maybe the committee can do this in a week or two. Then the people can go to work, and maybe it can be designed. Maybe it can't. But I ask the conferees to look at this.

I really believe we are on the verge of coming up with specific recommendations as to how we are going to clean up within 3 months.

Are you just talking in terms of abandoned mines? Because I think you are going to have to conside whether within 6 months they should meet certain criteria to stop the pollution from the active mines. This is something to consider later. But I do think, in terms of these abandoned mines, that we really should be getting the top priority items within 3 months. Again, the reason I suggest we can do it in 3 months is I think the first few are going to be very obvious. We may need a little more time on getting number 20 or number 21, but number 1 to 10 should be pretty obvious numbers on where we are going to get the largest return for our investment.

Well, with that, are there any other comments?

With that, let us --

MR. COOK: Murray, I have just a clarification here, Walter, if you will, please.

In the appendix of your report you list the active mines and the nonactive mines, i.e., those that have not started.

Under active mines, I notice that all of them, as far as I can tell, meet water quality standards. I don't find any active strip mines that are polluting. Is this correct?

MR. LYON: That is correct.

MR. COOK: And from Page D-14 through D-25, we have listed dozens of new strip mines. Permits have been granted.

Under "Treatment Required," "Yes."

"Does Treatment Meet Standards?" "Yes."

How can you tell whether it meets standards or not if it is not started yet?

MR. LYON: Because before a mine operator can get a permit for a strip mine in Pennsylvania, he has to submit his plans for a treatment plant by which he would treat the drainage that is developed in the pit. And that statement -- you know, it is a standard statement that we use throughout -- it is a form -- but what that means is that our engineers have reviewed his proposal for treating his wastes and that, in our opinion, when he operates his treatment will meet the standards.

MR. COOK: All right. The last four columns under "Project Status," we have nothing under "Schedule," "Final Plans," "Under Construction," etc. You do not have schedules for treatment?

MR. LYON: No, there are no schedules, because he has to have his treatment plant when he starts. There is no schedule. When he starts mining, he has got to have that treatment plant there.

MR. COOK: Ahead of mining coal, right?

MR. LYON: Right.

MR. COOK: It would seem to me like there ought to be a schedule there.

MR. LYON: What would you call a schedule? I wouldn't know what to call it.

I am sorry. We just somehow didn't conceive of a schedule to be something where you have to have something when you start doing something, you know.

MR. COOK: Well, it would seem to me that it would take some time to construct treatment facilities ahead of mining.

MR. LYON: That is correct.

MR. COOK: And I don't know how much time it would be -- I am no expert on mining -- but all of these show no entries whatsoever.

MR. LYON: Well, we don't care. The operator can take 2 years to build his treatment plant. As long as he isn't mining, he has no wastes to treat. We don't care how long it takes him, do you?

MR. COOK: Not as long as I am satisfied they are not polluting.

MR. LYON: Well, they can't pollute if they are not mining. A mine is a hole in the ground.

MR. COOK: I think the important thing probably is that all of those active mines are not polluting.

MR. LYON: That is right. And this is where we get the $6 million that the mining industry in Pennsylvania has spent. They have done a very fine job in taking care of the problem from the new mines that were started after the 1965 Act.

MR. COOK: No more comment.

MR. STEIN: Are there any other comments?

If not, we will stand recessed for lunch -- again, in taking the advice of little birdies on the time it will take -- we will reconvene at a quarter to 2:00.

(Noon recess.)

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## AFTERNOON SESSION

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MR. STEIN: Let's reconvene.

We will continue with the Pennsylvania presentation, Mr. Lyon.

MR. LYON: I would like to call, first of all, on a lady who was one of the first members of our new Citizens Advisory Board. As you know, Pennsylvania's environmental program has been reorganized to establish essentially three boards: one is a Citizens Advisory Board; another one is an Environmental Quality Board, which passes regulations and sets policies; and then lastly an Environmental Hearing Board, which, in a sense, is an environmental court in Pennsylvania and probably one of the first in the country.

So it is a real pleasure to introduce Mrs. Michelle Madoff, a member of Pennsylvania's Citizens Advisory Board.

### STATEMENT OF MRS. MICHELLE MADOFF,
### MEMBER, PENNSYLVANIA CITIZENS ADVISORY BOARD,
### PITTSBURGH, PENNSYLVANIA

MRS. MADOFF: Thank you for the kind words, Mr. Lyon.

Mrs. M. Madoff

In addition to serving on these committees, I might mention that I have attended 200 -- or perhaps a little more than that -- various board hearings as an intervenor on behalf of GASP and the citizens of this county, and this firsthand experience in dealing with the polluters of our environment has clearly pointed out that it is far easier to enact laws than to enforce them. And this is what I would like to address myself to today.

Where laws must be constantly updated and revised, laws without enforcement are exercises in futility, mere rhetoric. And while I have been given to understand that the main concern of this conference is directed to the problem of mine acid drainage for both operating and abandoned mines, we cannot overlook the fact that on the Monongahela alone there are hundreds of polluting outlets into our rivers from various industries, steel companies, etc., with virtually no enforcement. I want to repeat that -- no enforcement.

Note the following comments from our water control agency within the past year. Our pollution control laws are not being adequately enforced. There is a considerable need for the regulatory agencies to obtain more personnel to accomplish their present objectives. Our office is considerably understaffed. At the present time, our staff is not able to accomplish surveillance work. We are generally advised about pollution incidents from interested citizens and organizations such as yours.

We need attorneys, field investigators and engineers to adequately keep up with the problems today. Based on this information and on information from Colonel West -- who incidentally is doing his own 5-year studies and we wonder what kind of results we are going to get from that -- and many others, an intensive investigation was undertaken, and I was appalled to learn that of the 193 industries in the State, 93 percent of which are on schedules of compliance, there is only token inspection of polluting outlets to our rivers. Most sources are never inspected. A major source may have the bad fortune to have only -- well, to have all of two surveillance checks a year. This does not speak very well for the pollution control agencies. And yet are they really to blame when they are inadequately staffed; men who should be in the field inspecting are tied up with trivia, clerical work, deplorable working conditions, 14 men in a small room -- our prisons have better accommodations -- and while all this nonsense is going on, the polluter is laughing up his sleeve.

Now, there is no need to impress upon anyone here the importance of saving our waters for the life-giving needs of mankind, only to stress the need for enforcement which can only be accomplished by adequate numbers of properly trained men -- lawyers, chemists, engineers, inspectors -- all of whom must be properly staffed and equipped to perform their work.

A prerequisite for enforcement, then, becomes sizable funding. This should not -- and I repeat "not" -- be passed on to the already overburdened taxpayer. Now, I know we have many other States here, and we have many States from the United States and problems are all different. But an example of source of funding in our State -- and I am sure there must be comparable situations -- could come from moneys received from oil leases, approximately $500,000 a year; and approximately $600,000 from the sale of timber on our State land. The other obvious source would be fines that are presently paid to the State for infractions under the environmental laws as they exist presently and will exist. These moneys are currently being funneled into our General Fund and could be used to establish an enforcement fund. Now, that doesn't mean I want you not to supply us with Federal funds here in the State of Pennsylvania.

There is no earthly reason why any State should have to pay the cost of inspecting plants and premises of admitted polluters. Those polluters who apply for variances must be required to pay the cost of inspection personnel.

Mrs. M. Madoff

It might be feasible to assess polluting industries one-quarter of one percent of sales or profits to cover the cost of inspectors who must see to it that abatement equipment is being maintained.

I also learned recently that when a company applies for a pollution control abatement and submits a plan, he also pays $25, and it must cost the State sometimes between $800 and $1,000 to approve the plan, and that is being passed on to the taxpayer, and we ought to stop that.

EPA recently hired 10 private consulting firms to help because of the shortage of personnel in various States in the air pollution area. If it would be prudent because of a shortage of trained men in the field of water pollution control, why not again hire outside firms?

I have here a surveillance plan, which I plan to submit to this committee, from a very well-known firm that I will, as I say, submit for your inspection. Now, I am not advocating this particular company or any company or any firm, but the idea could be adapted by our own government control agencies or subcontracted to any consulting firm.

The basic premise is to have constant grab samples by 2-men teams in boats or in jeeps, depending on accessibility of outlets, photos of the sources, and lab work done on a blind study basis.

Now, you know this was already done by the infamous team of Nixon and Zavodni and, as you know, they won the first case under Mr. Thornburgh's handling, so we know that this type of grab sample is an effective way of catching the polluter.

It has been estimated that as many as 20 to 40 such samples could be done a day. This could be done on a county basis, each county responsible for outlets within its boundaries. The cost for each surveillance or grab sample would be prorated back to the polluter, probably at a complete cost of no more than $75 per check, and that is if you give it out to someone else and subcontract it. That would include everything -- lab work, photo, men, etc., etc.

No company is going to object to this fee since it is probably another tax deductible item -- particularly a small company like U.S. Steel. And I believe we are covered for this under our existing laws.

Another method of enforcement should be economic sanctions. Government contracts to companies -- for example, steel companies who supply steel rods for enforcement of our highways and are polluters to be a "no-no."

If there is any hope in reversing the degradation of our rivers -- and this enforcement again would apply to

MRS. MADOFF: I am not here to attack the EPA or defend Mr. Lyon. I am merely saying that on intensive research we find these are the facts in our State, and I am sure these must be the facts in other States. I think Mr. Lyon is quite capable of speaking for himself. I think the intent of this conference is to come up with some solutions, and obviously we have a very great weak link here on a local level.

Now, what the answer would be, and the reason I think it is important to have people come up to testify, is to have some input into your thinking here today as to how you could perhaps come up with some funding so that Mr. Lyon could -- and perhaps the other gentlemen from the other States -- come up with some answers to the solution of getting this manpower on these problems.

MR. STEIN: Here is the point. You are talking about outside consultants. We do have investigatory teams. Now, if you are suggesting that you want the State to ask us to come in and help us get into the plants, using the State police power, and if we find a violation that we will proceed, this may be a suggestion that the State may wish to consider, and we will be glad to take this up.

MRS. MADOFF: I think that if all else fails we should go this route, but I don't think that is what I said.

I said I think this is one of the solutions. and I also said that this system could be adapted to be done on a local level.

We could use an idea that I received from an outside consultant and have our own government people do it on a local level. But will there be enough funding coming from the Federal Government to the States to permit this? And I also suggested some way of coming up with some funding on the local level, so that the taxpayer isn't constantly getting the burden of the load.

MR. LYON: Mr. Chairman.

MR. STEIN: Yes.

MR. LYON: I think Mrs. Madoff has a very good suggestion, and, as you know, in some other States such as Michigan and Vermont that suggestion has found its way into the law. To come back to your point of having Federal people inspect Pennsylvania industries, let me suggest an alternative. Let me suggest that the Federal Government quit giving the States just 2 percent of the Federal water pollution dollar, and that it quit keeping 36 percent of the Federal water pollution dollar to itself.

I think it is a crime nowadays that in the whole United States there are only 3,000 people at the State level working in water pollution control. It takes 4,500 people just to run the Library of Congress in Washington, and the Federal Government thinks little enough of this problem that we only get 2 percent of the Federal water pollution dollar.

I suggest if we get a little bit more than that, we could fill that need that Mrs. Madoff is talking about.

MRS. MADOFF: Mr. Chairman, may I just comment again? I think one of the main points of what I was trying to say today wasn't lost, and that is that there is a great deal of funding to be available by making the polluter pay his own way. I think we wouldn't really need as much money as we think we would need. I think we would get it back. It would almost be a profit-making venture because I don't think the intent of industry is a voluntary compliance type of thing. This has been proven over the years. We are going to have to crack the whip over them.

MR. STEIN: Again, I think we have several points. I don't know that it is so much the Federal dollar. If you look in State after State -- and I expect the same thing is true in Pennsylvania as in other States -- you probably have more people working full-time on homicides than you do on pollution control, and pollution control is pervasive.

Here is the problem that we have, Mrs. Madoff: If you talk about allegations in general, about loads of industry discharging into the Monongahela -- and you are talking about handling this through a Federal funding operation -- this is one thing. This is fine, and I think it should be considered but it will take some time. But if you have specifics on this, and if you believe that people are discharging wastes -- and I think we have to deal with specific names and specific locations that are discharging wastes into the streams in violation of the law--we are prepared to go out and investigate those sources and take appropriate action. We stand ready to do that right now. But to get away from that and talk about 14 people in a room, Federal funds and State funds is another matter. If you or the State has an allegation and want us to check a particular source, we are prepared to go out and see if there is any evidence to be gathered. If we gather that evidence, we will take action to stop that under the law.

MRS. MADOFF: That becomes a matter of which came first, the chicken or the egg. How are you going to get out to find the polluters if you don't have the manpower or the money to get out there?

MR. STEIN: I just told you, madam, that we will supply you the manpower and the money to get out and get the evidence. Now what we need are the names and the places and the cooperation of the citizens groups and the State.

If that is what you are suggesting, and you have suggested this, we are ready to take up your offer. But don't let's slip off and talk in terms of broad programs of Federal funds.

If you have someone you know or you feel is violating the law, let us know.

MRS. MADOFF: Well, I think that is oversimplification when you say if I have a feeling or somebody in the citizen group knows who is violating the law.

I am not here to attack -- I repeat. It almost sounds like a confrontation. I think that this is a conference of goodwill. I would like to think that we are trying to come up with solutions, and I hope that I am making some constructive criticism or some input into ideas of areas that we can perhaps endeavor to work.

For example, in the air pollution variance board proceedings, every company must ask for a permit for a variance. Now, why don't we set this up with the water pollution? Every single company that has a source must come to our water pollution on the State level or on a county level, and say, "I would like a permit locally" -- not to the State. Therefore, we will know every source; we will have an inventory of sources; and further we must have a hearing board that would travel. I am not interested in a hearing in Philadelphia or a hearing in Harrisburg; I want that hearing board here in Pittsburgh so I can go down and say, "Well, the water may be clean enough to have some trout in it; it may be clean enough that we eventually can clean it so I can drink it, but aesthetically is it pretty? Can I swim in it?" And I think the hearing board should be right here. And, again, I am not trying to make this a confrontation. We are trying to put some input into where our funding can come from, not saying the Federal Government isn't doing the job and the State isn't doing the job. Facts are facts.

There is not enough surveillance; there is not enough enforcement. And don't say, "Could you go out and find it?" I am not going out in the river. I catch cold easily.

MR. STEIN: I am not suggesting that you go out in the river; I am suggesting we go out in the river. Again, let me point out, to use a hunting analogy — you know if you are saying there is a flock of geese and you want to shoot it and you just shoot at the flock, there are a lot of spaces in between and you are not going to hit anything.

Pollution control is dealing with specifics. Now, the point is, I think it would help very much if we didn't get people saying there were 1,400 sources or 4,000 or 400,000 sources. If we just begin naming the sources and getting in our specifics, we are ready to go out and get the evidence and stop those sources.

I think part of the problem we have had and what takes so much time is we get these general allegations and we never get down to specifics on who is doing the wrong thing. We would be delighted to cooperate with you, but I think the notion is we have to cooperate on a case-by-case, source-by-source basis, and I think this is something we all should look toward. I don't think this is a confrontation; we are ready to help.

MRS. MADOFF: I think it is the duty of the citizen not to pinpoint the polluter but to say to the enforcement agency, whether it is DER or EPA: Do the job. And perhaps what you are saying -- and if I hear you correctly -- is that what we have to do is put Nixon and Zavodni through a Xerox machine and come up with a few thousand people and let the citizens do it. I don't think that is the answer either.

MR. STEIN: I don't think you heard me correctly, because we were the ones who took the information when it was given from Nixon and Zavodni and suggested that they go ahead with the case.

What I am suggesting is that if you and the State feel that they can't have surveillance of the industry, and you can't do it because of lack of resources, all you have to do is get on the telephone to us, and we will get the resources down here and work with you.

MRS. MADOFF: Well, I thank you for that, and I think that is the most constructive statement that has been made here today. Thank you.

MR. STEIN: Thank you.

Mr. Lyon.

MR. LYON: Mr. Stein, the next speaker from Pennsylvania is the lady that Mrs. Madoff mentioned, Mrs. James Walsh, who is Chairman of the Environmental Quality of the League of Women Voters of Pennsylvania, and a lady who is very expert in the problems of the Monongahela and the Ohio Basin.

STATEMENT OF MRS. JAMES WALSH, CHAIRMAN,
ENVIRONMENTAL QUALITY, LEAGUE OF WOMEN VOTERS,
PITTSBURGH, PENNSYLVANIA

MRS. WALSH: Gentlemen, I am Mrs. James Walsh, Chairman of Environmental Quality for the League of Women Voters of Pennsylvania, speaking for the members of our 62 local Leagues throughout the Commonwealth.

I feel somewhat at a disadvantage not having seen the report -- or heard it before today -- of the Technical

Committee on a mine drainage program for the Monongahela River Basin, and we did have to write our statement without any knowledge of what was in the report.

Nevertheless, we do hope or did hope, I should say, for two results from this conference. First, we hope that all parties to the conference will agree that mine drainage from operating mines of all types can and should be controlled to the extent possible. Second, we hope that a beginning will be made now on a program to abate mine drainage from abandoned mines. And I might add here in support of Mr. Lyon, as a citizen of Pennsylvania, when he questions the length of time and how long it has taken between 1963 and now, that I did participate in 1968 -- when the State of Pennsylvania invited the National Pollution Control Advisory Board here to look at the abandoned mine drainage program that Pennsylvania had instituted -- and begged then for some Federal money and interest in the abandoned mine problems.

Eight and a half years ago, the dominant mood of the first enforcement conference was that acid mine drainage from both deep and abandoned mines was responsible for virtually all the ills of the Monongahela, that nothing could be done about it, and therefore there wasn't much point in worrying about other problems.

A lot has happened in Pennsylvania since then, as you well know. All mine drainage is now subject to the same controls as other industrial wastes, and a pollution abatement program for abandoned mines has been initiated. The measurable results of these two steps admittedly have been modest. Still, members of the League of Women Voters of Pennsylvania believe that the shift in attitude from a negative one of "the problem's too big and the solution's too costly" to a positive approach of "let's do what we can now" was an important turning point and accomplishment. We very much hope the positive approach will become more prevalent.

We do not expect instant abatement. We are aware that there are technological limitations. But we do not think it unreasonable to demand that a start be made now -- and I mean today -- on a mine drainage abatement program for the Monongahela Basin, no matter how small. And we are a little fearful that the conferees today will once again defer all action because of the enormous costs involved in abating abandoned mine drainage, and because we do not know how much, if any, money will be allocated for a Monongahela Basin program by the Federal Government. Abandoned mine drainage problems exist in all of Pennsylvania's large river basins -- the Allegheny, the Susquehanna, and the Delaware. As a spokesman for all League members in Pennsylvania, I am not here to advocate that the Monongahela be given priority over other river basins in the Commonwealth or in all the other 22 States in the United States that have mining. Rather, I would like to urge that we not be so preoccupied with multi-million and billion dollar price tags that we forget that pennies are still coin of the realm.

I was rather interested this morning that $60 million was mentioned as a minimum figure for cleaning up some of the abandoned mine drainage in the Monongahela Basin program. Frankly, I think that is rather cheap and a wonderful price. The comprehensive survey for the Ohio River Basin of the Corps of Engineers -- and Colonel West is not here to gainsay me -- I think was $2 billion. If we are the worst and the $2 billion figure perhaps was blown up, $60 million seems pretty cheap.

We are also concerned that the conferees will not give serious consideration to regulating the drainage from operating mines in the basin. The fact that abandoned mines contribute such a high proportion of the total acid and iron load ought not to be a deterrent to reducing deleterious drainage where possible. Even a small reduction would be beneficial and represent progress. And I am not technically equipped to put a figure on what I mean by "small" or we mean by "small," but I should insert here that we have a

Mrs. J. Walsh

problem right here in Allegheny County, Mr. Stein, that would benefit from some reduction in the total dissolved solids of the river. And since mine drainage has been listed as the greatest contributor, I refer to a very complex and interrelated problem of air pollution versus water pollution in the Clairton Coke Works. And no matter what happens ultimately, we are faced with the fact that either there has to be a violation, which is not defensible, of our stream standards in dissolved solids, or we are going to have to reduce somewhere else on the stream the dissolved solids. The result is perhaps not an improvement in water quality but at least we are not degrading it further.

The format for reporting water quality conditions in the tributaries of the Ohio River has changed over the years in the ORSANCO Annual Reports making it difficult for laymen to interpret data concentrations of pH, dissolved iron, dissolved solids, and hardness between the Point Marion, Charleroi and South Pittsburgh monitoring stations. These were the years before Pennsylvania required control of drainage from deep mines. The 1968 and 1969 figures show a decrease in concentrations between Point Marion and South Pittsburgh in the various quality measurements that I have referred to. If these figures are not definitive proof of the impact of control on acid drainage from operating mines, they are at least suggestive.

As for other conditions on the Monongahela, according to the 1970 ORSANCO Annual Report, the Monongahela has the worst record of all the tributaries of the Ohio when it comes to municipal sewage treatment facilities. It has the highest percent of no treatment provided for the sewered population and the lowest percent of secondary treatment. In fact, if you go back to the 1966 ORSANCO Report, we have been retrogressing, not improving. The population of sewered communities without treatment facilities in 1966 was 229,096. The 1970 Report indicates that the 1966 population total of sewered communities not providing treatment has been reduced by 792 people.

Gentlemen, this is an alarming and indefensible record. Yes, it takes money. Yes, the ultimate solutions to mine acid control may be a long way off. But we say "no" to prolonging the policy of not doing what can be done now simply because we don't have the money or technology to do the whole job at once. The tomorrow of a better environment will never come if we don't start crawling toward it.

Thank you, gentlemen. We appreciate this opportunity to express our views.

MR. STEIN: Are there any comments or questions?

Thank you very much. Without reading the report, you certainly have anticipated what was in it. It was very good, because I think both your points are taken up. One point is that as far as the operating moneys are concerned -- at least the Federal proposal -- is that the discharges meet certain conditions which will not be contributing to the pollution and that be done within 6 months, and there be a start made on controlling the nonoperating mines.

So, I think this is very encouraging, because we all seem to be thinking in the same direction and making the same points.

Mr. Lyon.

MR. LYON: Mr. Chairman, the next speaker -- the fact that he is appearing relates to a point you have just made. Mr. Nixon is a member of the team of Nixon and Zavodni, who have given of their own time to help Pennsylvania with their pollution problems.

As you probably know, they brought their evidence of pollution violations of State and Federal law to the Federal attorney. And Pennsylvania's Attorney General has asked for the evidence so that Pennsylvania could take the kind of compliance action, in addition to the criminal action, which the Federal Government is taking, in order to get this pollution problem cleaned up.

So far the Federal Government has not been willing in any way to either give us the evidence or cooperate with us, and I would suggest that here is one case, or two, or three, where you could take some specific action in order to bring them into compliance.

Mr. Nixon has indicated that he has a statement, and he also has indicated that he would like to ask me some questions, and I would suggest, if you permit it, that we suspend the rules to allow him to ask me some questions.

MR. STEIN: Well, that is not a suspension of the rules; he can do that within the rules. I thought I made it clear that if you have any questions you want to direct to the panel or any of our staff, if you wait until you come up in your presentation, you can use as much of your presentation period as you wish to promulgating the series of questions.

## STATEMENT OF DAVID G. NIXON,
## PENN STATE UNIVERSITY, PITTSBURGH, PENNSYLVANIA

MR. NIXON: Thank you very much.

I would like first to add what support I can to the suggestions made by Mrs. Michelle Madoff, who urged the consideration of great support being given to the citizen efforts to bring about a more vigorous enforcement of Federal and State and local water pollution control legislation.

The questions that I have in mind -- I would like to return in just a minute to the subject of governmental support to citizen action projects -- but I would like to ask Mr. Lyon a couple of questions which I think may illustrate to some extent the nature of the problem we are confronting.

Specifically, referring, Mr. Lyon, to the report issued or which I received today -- your Publication No. 29, in the Appendix A -- well, first, let me ask you: What is the source of the data that is summarized in Appendix A?

MR. LYON: They are our records in the Department of Environmental Resources.

MR. NIXON: How do those records come to be compiled? I mean, for example, how is it possible or how do you come to know, for example, on page A-3 that the United States Steel Corporation plant at Duquesne is, in fact, complying or that its discharges do comply with treatment standards? How specifically is that information gathered?

MR. LYON: Well, as Mrs. Madoff has already told you -- in fact, she read a letter which either I or someone on my staff --

MRS. MADOFF: Mr. Luley.

MR. LYON: -- Mr. Luley, our Regional Engineer, wrote.

D. Nixon

We are very dissatisfied with the amount of inspecting and the amount of detail that we can go in with. We are seriously understaffed and, to answer your question, it is based on records that the company has submitted, inspections that we have made. I would be the first one to tell you that they are not as complete as we would like them to be. To inspect a plant like that completely takes several weeks, and then you might miss something. So it is as complete a record as we have.

MR. NIXON: Thank you, sir.

I would add here — and certainly I intend this in no respect as an attack on Mr. Lyon or the job that his people are doing — but I would point out that I know of my own knowledge that that plant is discharging high volume discharges, 180° F. Now I am not alleging that that is in violation of the law, but if it isn't, it ought to be. The company, at that location, is discharging steadily oil that I have witnessed myself, which I have documented myself. And I am not saying, at this time, that that discharge is in violation of Pennsylvania law, but if it isn't, it ought to be. And similarly one could go on, just as one other example — I don't have my data here so I am working pretty much from memory — but again, the same situation exists — I notice on page A-13 of the same Appendix, the mentioning of

Hercules, Inc. at Donor Boro. Treatment provided - yes. Does treatment meet standards? Yes.

Again, I from my own personal recollection, I know that suspended or total solids sampled at that location have exceeded 98,000 ppm; the pH in excess of 11 to 13.

Now again, that may not be in violation of the law, but it sure ought to be, it seems to me.

MR. LYON: Mr. Nixon, it is.

My problem is that we can't get your evidence. All the Federal Government has done is to take punitive action, which is a minor item as far as a big company like that is concerned. We would like to take compliance action, which means court action designed to get them into compliance with the law, but the Federal attorney will not give us the evidence.

Now, we will go out and get it ourselves, but that will mean that we won't be able to go after somebody else. It seems silly to me if you have already taken the time and energy to collect this information why we can't have it so we can act on it.

Would you be willing to give us this evidence?

MR. NIXON: I, for my part, would certainly go this far: I can tell you, sir, that if the State or Federal

Government would underwrite citizen action projects by guaranteeing, for example, that wherever citizen action project is organized — and I have letters from all over the State of Pennsylvania from people who are willing to do this without such guarantees — but if the State or Federal Government was able to guarantee to citizens that if they go out and carefully document samples that the chemical analysis will be done — guaranteed to be done by the State or by the Federal Government.

Now, earlier there was a mention made of — well, if we can just have the names and locations of the dischargers, then the Federal Government would take action.

In practice, in operation, it is much more difficult than that because it is necessary to document within very narrow tolerances the precise locations of discharges to within plus or minus 100 feet, let's say.

Now in that situation, if one documents a location that clearly, one might just as well go ahead and take the sample. There is no reason on having the State or Federal Government duplicate citizen sampling if either or both would guarantee the citizen that his samples will be analyzed. And on that basis —

MR. LYON: Mr. Nixon, you really haven't answered my question though.

MR. NIXON: I am getting to an answer.

MR. LYON: You have told me about a violation of the law. We want to do something about it. Will you give us the evidence?

MR. NIXON: I am getting to the answer of your question.

Under that arrangement, I would be very happy to share such evidence with the State on the understanding that if enforcement could not be gotten at one level it would be gotten at another. Frankly, the citizens don't care whether it is the State level or the Federal level which enforces the law and stops the pollution.

The reason our evidence went to the United States attorney was because, correctly or incorrectly, we believe that the Refuse Act of 1899 was the most enforceable single piece of water pollution control legislation on the books, particularly with respect to citizen action.

Many of the mills, for example, which are being prosecuted for Refuse Act violations are marked in this book as meeting current water treatment standards. Now we have provided evidence to the United States attorney, as you know. We documented 392 violations — or what we thought to be violations of the law. Now 73 charges have been filed on the basis of that information, and I am sure that if there is no further Federal action on that information, you are more than welcome to whatever the Federal Government refuses to prosecute.

MR. LYON: Mr. Nixon, I am sure the Federal Government is going to take punitive action, but that doesn't get the pollution cleaned up.

My question is: Even if they do take punitive action, but don't take compliance action -- you know, like an injunction to make the company clean up the pollution, which is what we are all after -- will you give us the evidence?

The gentleman who has just gotten up is a Deputy Attorney General for the State of Pennsylvania, and he can assure you that he will take this kind of compliance action. His problem is that neither you nor the Federal attorney will give him the evidence. That is our problem. We will move, but we have got to have the evidence.

MR. NIXON: Well, in answer to your question, I have stated that after it is clear to us that there will be no more Federal prosecutions, we will be glad to cooperate and provide you with whatever data we have.

Beyond that, I would state that, again, the citizens -- and in this case John Zavodni and myself -- went to the one place where we thought prosecutions were most likely, under the Refuse Act.

Secondly, it should be pointed out that while criminal prosecutions of polluters do not in and of themselves cure the pollution problem, it does focus attention. It was not long after -- I cannot demonstrate to you that there is a cause-and-effect relationship here -- but it was not long after our submission of evidence to the United States attorney documenting discharges into the navigable rivers of this area that the Environmental Protection Agency did a repeat, in effect, of our study, and it is my understanding that injunctive or civil action seeking injunctions were the result of that.

What the citizen, it seems to me, is trying to do is to provoke agencies into enforcing the law. And it would be prideful to maintain that a few citizens can cure the pollution problem. That isn't the intention. We don't believe it. But we hope that we can provoke perhaps more consistent and more vigorous enforcement of the law which, I think, sir, you would agree has not been forthcoming in the past.

MR. LYON: Mr. Nixon, maybe I should have mentioned this in our presentation. I think it is an important point. The State of Pennsylvania has taken over 700 enforcement actions in the Monongahela Basin.

Let me ask you some questions. How many cases did you find where there was pollution? About how many?

MR. NIXON: We documented 392 cases.

MR. LYON: Okay. As far as we know, one case has been prosecuted. That case is on appeal. If there has been an injunction filed, would you tell us which one has been filed and when it was filed?

MR. NIXON: I believe there are people from EPA who can correct me if I am wrong, but I believe that Wheeling-Pittsburgh Plant at Monessen was the subject of Environmental Protection Agency action.

MR. LYON: Murray, do you know if there was an injunction filed?

MR. COOK: There are some 11 cases, I believe -- 10 or 11 cases -- that are just about ready to be pushed forward, i.e., provided to the U.S. Attorney. They are not all, I don't believe, in this area but there are many more possibilities, of course, and the fact that criminal action has been taken against one or maybe against several does not make these companies immune to injunctive proceedings.

MR. LYON: When are the injunctions going to be filed?

MR. COOK: I can't tell you that; that is out of our hands.

MR. LYON: I just have one more question, and I don't mean to derogate what Mr. Nixon did, because I think we need more citizens who are concerned about pollution as he and his colleague are.

But how long are you going to wait before you turn this over to us? You said you wanted to see whether the Federal people take some action. Now what is your lock deadline; by when are you going to turn this evidence over to us?

MR. NIXON: Let me answer your question this way. Frankly, if this is the reaction of government -- no matter what level -- that the citizen attempts to get some action, the other level of government, whether it be Federal or county, if he is working with the State, resent it.

Now it seems to me there is no padlock on that river out there; if you want data there is plenty out there to gather.

MR. LYON: Mr. Nixon --

MR. NIXON: Now, the point is, sir, that when a citizen is attempting to get something done to the river, he hears a great deal more about whether you are going to cooperate with this level of government versus some other level of government or whether we are going to try to get the job done through a cooperative effort. And it seems to me we have heard more here today about backbiting between one level of government and another than serves any useful purpose in doing anything about improving the condition of the Monongahela River.

Thank you.

MR. LYON: I am sorry it ended on this note, Mr. Nixon, but let me assure you that we are interested in pollution control. And if the Federal Government takes injunction action, we see no need to take it, but frankly we would like to see this pollution that you found cleaned up. We would like to see something done about it. So far nothing has been done about it except punitive action, and that is not enough. That doesn't clean the river up.

If the Federal Government takes injunctive action, that is fine. But if they don't, we think we should. And we are out on the river, we are finding cases, and we are taking injunctive action. And if you would like to hear more detail about that, Mr. Fein will be happy to talk to you about that.

MR. STEIN: Are there any other comments or questions?

I would like to point out that in these appendixes to the State report, we have specific names and places. If the State or any citizens believes or has reason to believe, or we have reason to believe that this report is not accurate on the basis of what you know, this is what we have to have to move on.

Now I don't think -- and I want to make this clear -- in other words, we don't have to have this within a hundred yards of a discharge. But if we put out anything, or the State puts out anything in the notion of whether treatment is provided that is not accurate, whether it meets the standards, whether there is a status of the project and this isn't correct -- I think if you let us know, we will take action, and we will do this with the cooperation of the State.

Now again, I hope I make this clear. As far as we are concerned, our function here is to recognize the primary rights and responsibilities of the State. We are delighted to have the State take action in this, and we have always encouraged the State in taking action. You may have this question of the citizen problem and my personal view is that this should be encouraged. We should do everything we can to encourage the kind of citizen activity that Mr. Nixon had.

I would like to just give you this general notion. As far as I am concerned, we have been working closely with Pennsylvania, as with Maryland and with West Virginia through.

the years. Obviously when there are different levels of government or different agencies of government involved, there may be differences. I have never experienced what I would call backbiting in any way.

However, what I think we have to recognize, too -- and I don't want the silence of some of the Federal people on some of these issues to be misconstrued -- once a case goes to court and is in litigation -- and I speak for myself as a lawyer working for the Federal Government -- we are pretty much circumscribed in the forums in which we can discuss the details of that case.

Now, for whatever reason -- and I think they are probably good reasons -- Mr. Nixon went to the United States attorney. The United States attorney has charge of that case. The case is under litigation now, and it is moving forward. And, as far as I can see, the Federal Government has no difference with the State of Pennsylvania in the question of who is going to do this. As a matter of fact, we would love Pennsylvania to take as much of this on as they can because we have other areas to go to.

Again, I would suggest that possibly if you want your data of pollution control gathered -- if you are interested in things other than the main subject we are talking about, which is acid mine drainage -- you should go through

D. Nixon

these lists of industries and municipalities here. If you think that any of this is not accurate, I am sure if you get in touch with Mr. Lyon or us, we will see that appropriate action is taken, and this gets made accurate. And let me tell you this: If you come to us with any statement here that one of these things is wrong, the first thing we would do is call on Mr. Lyon and ask him about it.

In other words, we are not working here checking on the State. The State isn't the polluter. We are cooperating with the State. I think this has to be understood.

Mr. Lyon.

MR. LYON: To get us back to the subject of mine drainage, I would like to ask Mr. James Boyer, who is Manager of the Environmental Control of Bituminous Coal Research, to speak next. Bituminous Coal Research, as I am sure he will tell you, has done a great deal of research in the mine drainage and air pollution control field.

Jim.

VOICE: Mr. Lyon, Mr. Garvey, President of BCR, is going to present the Coal Association's statement.

MR. LYON: Fine. Mr. Garvey will speak. James R. Garvey -- G-a-r-v-e-y.

STATEMENT OF JAMES R. GARVEY, VICE PRESIDENT
NATIONAL COAL ASSOCIATION, WASHINGTON, D.C.

MR. GARVEY: We have copies both for the panel and some for the press.

MR. STEIN: How about the reporter? The reporter really has the highest priority. Give her the first copy before the panel or the press.

MR. GARVEY: Unfortunately the attachment to my prepared statement -- we did not have sufficient copies of that. We have enough for the conferees, and I am sure for the reporter.

MR. STEIN: Do you mean the printed copy?

MR. GARVEY: That we do not have enough of.

MR. STEIN: How do you want this to appear, as an exhibit?

MR. GARVEY: Yes.

MR. STEIN: All right. This will appear as an exhibit, as part of the record, entitled "Acid Mine Drainage, Sub-Council Report, February 1971, National Industrial Pollution Control Council."*

MR. GARVEY: Thank you.

(The above-mentioned exhibit is on file at HQ, EPA, Washington, D.C., and Region III, Philadelphia, Pennsylvania.)

MR. GARVEY: My name is James R. Garvey. I am executive vice president of the National Coal Association, with offices in Washington, D.C., and I am also president and director of research of NCA's research affiliate, Bituminous Coal Research, Inc., which is located at Monroeville, Pennsylvania.

I am appearing here today on behalf of the members of the National Coal Association, Keystone Bituminous Coal Operators Association, Western Pennsylvania Coal Operators Association, West Virginia Coal Association, and the Northern West Virginia Coal Association. These companies employ some 25,000 persons and produce approximately 70 million tons of coal annually in the Monongahela River Valley.

As you are all aware, we are faced with an impending energy crisis that will require the full development and utilization of our energy resources. It is projected that in the next 30 years energy demand will increase at least two and possibly threefold. Coal, including the resources available in the Monongahela Valley, must play a major role in satisfying that demand. Even the AEC admits that by the year 2000 the atom will account for only half of our electric generating capacity. And oil and gas industry spokesmen have stated that oil and gas from coal must supplement the dwindling natural resources of these fuels

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before the end of the century.

We are concerned today with the environmental problems created by coal mine drainage and specifically with the report entitled "Mine Drainage Report to Conferees."

We in the industry have carefully reviewed this report and wish to direct our comments toward several of the recommendations. In the interest of simplicity we will attempt to discuss them in the sequence in which they are presented in this report.

Recommendation 1 suggests the need for a Remedial Project Committee for the Monongahela River Basin comprised of representatives of West Virginia, Pennsylvania, Maryland, ORSANCO, and the Federal Government.

We endorse this recommendation since we believe that the agencies of the various States should be represented and have essentially equal voice in the direction and implementation of abatement programs.

However, we believe that it will benefit this committee to receive input from individuals outside of government who are knowledgeable with respect to the specific problems associated with coal mining. We strongly recommend that an advisory committee be appointed to assist the Remedial Project Committee and that such an advisory committee be comprised principally of technical

J. Garvey

representatives of the coal companies operating in the Monongahela River Basin. We further believe that other individuals who are experienced in controlling pollution problems arising from municipalities and other industrial wastes should also be included on such a committee.

We have no quarrel with the second recommendation and presume that the funds necessary for the abatement of mine drainage in the Monongahela Basin will be made available by governmental bodies. It also appears appropriate that the Remedial Project Committee should make the final decisions with respect to allocation of the funds.

With respect to the third recommendation, we strongly support the concept of establishing criteria for assigning priorities to areas or sub-basins which are to receive abatement measures and to base the sequence of remedial work on these priorities.

The most important factor in establishing priorities is the cost/benefit ratio, and we anticipate that this ratio will become increasingly more appealing in the future. This will result from refinement in abatement technology which will reduce the costs and additional demands for usable water which will increase the benefits. It is therefore apparent that the long-range program should be planned to take into account a changing cost/benefit ratio.

Another factor that must be considered when establishing priorities is the possibility that part of the coal resource might be lost due to the installation of abatement measures that would prevent future mining in a particular area. This potential resource loss is of concern not only to the coal industry but also to our Nation's future generations who must depend on coal as the bedrock energy source.

We most certainly agree with the recommendation set forth in 3-c, since the report amply illustrates the difficulties in developing pollution abatement measures for selected projects. For example, a hypothetical case cited in the report admittedly has a tenfold cost uncertainty and only careful study will permit realistic estimates for the cost of selected projects. We do not envy the task of those who attempt to develop such figures and costs. Admittedly, many of the technical aspects of abandoned mine drainage pollution control are far from proven. For example, much more research needs to be accomplished in the area of mine closure and mine sealing. As a matter of fact, that may be the most critical area in the entire abatement program since it makes little sense to install treatment plants for mine drainage effluents which must be operated indefinitely. Although the Environmental Protection Agency and its predecessor have supported some recent efforts in these areas, we believe that in view of the critical nature of the mine closure and sealing problem, such efforts should be greatly expanded.

With respect to 3-d, we believe that Pennsylvania, West Virginia, Maryland, and ORSANCO have adequate programs for abating present and future pollution from active mining operations. Each has adopted stream quality standards, and through the State permit systems are moving forward on abating pollution problems from active mines. However, we have viewed with dismay the proliferation of rules, regulations, and accompanying paperwork required to meet the ever-increasing demands of Federal legislation. In our opinion, this on the whole has retarded rather than stimulated the efforts of State governments and industry to reach mutually satisfactory agreements with respect to the abatement of stream pollution.

We would like to comment in some detail on Recommendation 3-f which suggests that the Remedial Project Committee determine the amount of financial assistance required by the States to carry out selected abatement projects. It is not clear to us as to the source of such "financial assistance" or the breadth of activities to be supported. This may refer to supporting regulatory and enforcement activities by the States, industrial research activities to abate pollution from mine drainage or financial assistance for taking care of the abandoned mine drainage problem. We believe that Federal funds should be made available to support in part the regulatory activities of the States. However, we believe that the research activities and the funds necessary to solve the abandoned mine drainage problems are solely the responsibility of the Federal Government. In the course of this Nation's development, a plentiful low-cost supply of energy was needed. Until recent years, the principal criteria used in obtaining this low-cost energy, or for that matter, any other commodity, was the cost of raw material or product. In fact, our Nation's affluency did not reach a level that permitted concern about the environment until the mid-1950's. Nor was the technology available to successfully control pollution if sufficient environmental concern had existed. Almost invariably this low-cost product was obtained at the cost of a degraded environment and those individual States which had coal deposits suffered the greatest damage. Consequently, the Nation has built up a deferred debt in environmental quality which must now be paid. Actually, this is little different from our national fiscal debt and that also should be repaid by revenue raised from broad-based taxes derived from the Nation as a whole.

Recommendation 4 suggests that the Water Quality

Control Office of EPA provide the technical staff to assist the Remedial Project Committee. We have no objections to this as long as the technical staff takes advantage of the proposed advisory committee in order to more effectively and economically solve specific pollution problems.

We note with concern the May 1, 1971, letter from Henry P. Stetina, Director, Office of Enforcement, EPA, to the Chairman of the Monongahela Enforcement Conference on the subject "Legal Problems of Coal Mine Reclamation and Drainage Abatement in Appalachia," Presumably this letter describes the present status of the legal study referred to in Recommendation 5, page 17, of the "Mine Drainage Report to Conferees." It appears to us that the comments contained therein go far beyond the assignment described in Recommnedation 5.

For example, the last paragraph of page 1 of Mr. Stetina's letter states, "The more difficult problems have to do with abandoned mines. First is the problem of identifying who can be made financially responsible, and who ought to be made financially responsible, for abatement or reclamation work."

It appears to us that the Environmental Protection Agency is looking for scapegoats to whom the responsibility for the abandoned mines cleanup can be legally assigned. We have made ourselves abundantly clear on this particular point; specifically that the abandoned mine problem represents a deferred national debt that should be corrected through remedial projects funded by the Federal Government.

We are in complete agreement with Recommendation 6, namely that the State governments will adopt and implement programs to abate present and future pollution from active coal mining operations as well as those presently active mines which will be inactivated in the future.

However, we believe that the recommendation is incomplete by not addressing itself to the problems associated with abandoned and inactive mines. We recommend that the following paragraph be added: "The States and the Environmental Protection Agency recognize that the mine drainage pollution problem resulting from drainage from abandoned and inactive mines represents a 'deferred environmental debt' and that the funds for correcting such pollution problems should be derived from broad-based Federal tax money. Furthermore, mine operators reopening an inactive mine should be held responsible only for the incremental pollution load."

Recommendation 7 suggests that $5 million be made available to be used for the purpose of initiating engineering studies to determine specific project costs, and to fund contracted projects.

J. Garvey

We feel that $5 million is a pitifully small amount to assign for a problem of this magnitude. Admittedly, this amount might be sufficient to initiate engineering studies but vast amounts must be appropriated in the future for further engineering studies and for action projects. Neither this $5 million nor the larger sums ($60 million to $490 million) mentioned in the body of the report will make any significant impact upon the total abandoned mine pollution problem. We are fearful that the mention of $5 million will delude the public into unrealistic expectations.

The cost of corrective programs instead will run into billions of dollars. To place these costs in a better perspective, we are attaching to our statement a copy of a February 1971 National Industrial Pollution Control Council Report entitled "Acid Mine Drainage." (See P. 120)

In summary we believe:

1. That pollution abatement programs should be carried out on a watershed or sub-basin basis.

2. That priorities should be established that recognize the changing cost benefit ratio and the necessity to recover the coal resources remaining in the valley.

3. That acid mine drainage problems should not be considered alone. Simultaneous control of pollution from municipal and other industrial sources should receive

the same attention.

4. That a technical advisory committee should be appointed to assist the Remedial Project Committee.

5. That State regulatory and enforcement programs are adequate for controlling acid mine drainage emanating from active coal mining operations.

6. That pollution from abandoned mines and inactive mines represents a "deferred environmental debt," the solution of which should be financed by broad-base Federal tax money.

7. That present funding for the mine drainage problem is totally inadequate.

8. That Congress should be apprised of the costs and benefits of specific remedial projects so that the necessary Federal funds be made available for corrective programs.

Gentlemen, conferees, I appreciate this opportunity to present our comments on the Technical Committee's recommendations and will attempt to answer any specific questions you might have.

As was indicated by Mr. Lyon, I am accompanied by Mr. James Boyer, who is in charge of the environmental control work for our organization, Bituminous Coal Research, and he has worked with most of the people on this conference, and I am sure if I can't answer the questions, Jim can. Thank you.

MR. STEIN: Thank you, Mr. Garvey.

Any comments or questions?

MR. LYON: Just a brief one, Mr. Chairman.

This is an appropriate time to say for the record that since these conferees met in 1963, Pennsylvania's Legislature passed an amendment to the Clean Streams Law which put acid mine drainage and active mines on the same basis with other forms of pollution.

No industry ever has responded as rapidly to a new law in Pennsylvania as Pennsylvania s coal industry. Within 4 years nearly every mine in Pennsylvania had a treatment plant. Our strip mines are being restored in nearly every case with contour and planted so that several years after the strip mining is finished you wouldn't know that there has been a strip mine there. We feel this has been an outstanding accomplishment on the part of the Pennsylvania industry.

MR. STEIN: Any other comments or questions?

MR. COOK: I have one.

MR. STEIN: Yes, Mr. Cook.

MR. COOK: I would like to ask Mr. Garvey: How old is the Bituminous Coal Research, Inc.? How old an organization is this?

MR. GARVEY: Originally incorporated in 1937.

MR. COOK: Has there been any other such similar organization in the history of the coal industry in Pennsylvania?

MR. GARVEY: Not in the form of a laboratory, no, sir.

MR. COOK: Would you have records showing where -- the ownership of old mines, abandoned mines?

MR. GARVEY: No, we have nothing to do with the production of coal. Our goal in life is to conduct research to enable better techniques for mining it, for controlling pollution in mining, for utilization of coal, converting it to gas, air pollution problems, and so on. We have nothing to do with the production of coal.

MR. COOK: Is there, to your knowledge, an organization that could provide that information?

MR. GARVEY: To my knowledge, there is not.

MR. COOK: Thank you.

MR. STEIN: Mr. Garvey, are there any other comments or questions?

I would like to see if we can get a clarification on one point because the citizens groups seem to have asked repeatedly about this. If we have a committee to carry forward, you are suggesting that we select individuals, knowledgeable with respect to specific problems associated with coal mining, and an advisory committee, comprised principally of technical representatives of coal companies operating in the Monongahela River Basin; then you say further that other individuals, experienced in controlling pollution problems arising from municipal and industrial wastes, should also be included on such a committee.

How would you react to a suggestion for including on this committee citizen representatives of the groups we have had here, who also think that they should be on the committee?

**MR. GARVEY:** I think it would be very worthwhile, so we would have the views of everyone concerned with this problem.

**MR. STEIN:** Well, I think we are making progress. In other words, you wouldn't suggest, if we were to go there, that the committee be comprised principally of technical representatives of coal companies, but what would you thknk of a committee where we had a balance -- or what everyone considered was a reasonable balance -- with citizens groups and groups of the companies?

**MR. GARVEY:** So we understand what I am talking about, I am not talking about the Remedial Project Committee itself; I am talking about an advisory committee to that committee, more or less of a subcommittee.

MR. STEIN: That is right.

MR. GARVEY: In this context I think we should get all of the input that it is possible to get both from a technical and from a citizen's view side of it.

MR. STEIN: I would tend to agree with you, Mr. Garvey. I would like to have your views on this. But I do think that we might have trouble getting citizens to serve if this committee were to be comprised principally of technical representatives of the coal companies. They might want to serve if we had the view that you expressed here, and I think that is a good operation.

Now, one thing I will say about the coal company presentation: We may have a long time between conferences but you don't change very much.

This cost/benefit ratio may be for priorities, but you know it is proposed that cost/benefit be used for pollution control, and it has been before various States and the Congress many times. They have never adopted that.

MR. LYON: I am afraid you might misunderstand what Mr. Garvey tried to say. I don't think he is suggesting, were you, that this be used for active mines?

MR. GARVEY: No.

MR. LYON: He is only talking about what I was talking about this morning.

MR. GARVEY: I am talking about the abandoned mines.

MR. STEIN: That is what I wanted to say, priorities. All right, we just needed priorities.

Now, what you say down here at the bottom of page 3, for example: "... much more research needs to be accomplished in the area of mine closure and mine sealing. As a matter of fact, that may be the most critical area in the entire abatement program since it makes little sense to install treatment plants ..." — and so forth.

Do you suggest that we are not ready to go ahead with a remedial program for abandoned mines without doing much more research?

MR. GARVEY: No, I am not.

MR. STEIN: All right.

MR. GARVEY: All I am doing is trying to face up to the fact that we may not have the ultimate solution to this problem at the present time, but I believe — and I believe Mr. Lyon brought this out this morning — there are things that can be done. We should find out how much money we have to spend — how much the Federal Government is going to spend to do this, because we sincerely believe this is the only way this can be funded — and that on the basis of cost/benefit ratio or any other basis you want to put it on, select those areas where something can be initiated now on abandoned mines within the funds that are available.

**MR. STEIN:** Then, I think -- again, I am looking for areas of agreement -- in other words, you are not saying that we cannot have an abatement program now until we have done additional work on research on mine closure or mine sealing.

**MR. GARVEY:** They should be done together.

**MR. STEIN:** All right. That is fine.

Now again -- and I don't know which is going to change first, but I guess you are never going to change -- it says that Pennsylvania, West Virginia, Maryland, and ORSANCO have adequate programs for abating present and future pollution from active mining operations. Notice everyone is mentioned except the Federal Government. We have too much paperwork, rules and regulations, and our efforts have retarded rather than stimulated the efforts of State governments and industry to reach mutually satisfactory agreements with respect to the abatement of stream pollution.

Maybe if we weren't here, we would have these waters cleaned up by these mutually satisfactory agreements between the States and the industry. But you find that the Federal Government does have a role. That is we have to have research; funds necessary are solely the responsibility of the Federal Government; we regard this as a "deferred environmental debt."

In other words, the position of the coal industry remains: we leave the regulation to the States and the interstate agencies, but Uncle Sam puts up the dough.

MR. GARVEY: I don't believe that is exactly what I said.

MR. STEIN: Well, I would like to hear an explanation.

MR. GARVEY: What I tried to say, and tried to separate these two out as, the active mine versus the inactive mine.

I believe, as far as the active mines are concerned, programs have been developed — Mr. Walter Lyon has pointed this out several times. What has been done in Pennsylvania has been done in other States, I am sure.

As a matter of fact, the $6 million figure which was mentioned for Pennsylvania is only a small part of the cost to the industry of achieving control in active mines, because there has to be changes in techniques for mining. There is coal left in order to provide a barrier. There is a lot of people that are involved in this thing. And the $6 million I believe is only a part of the total cost.

But when we get over to the abandoned mines, the inactive mines -- whatever you want to call them -- this is where I feel that the Federal Government has to put up the funding not only to conduct research to find out the best way of doing it but also to take on this job, which is going to be tremendously expensive. And I am sorry that somebody kicked out a number of $5 or $60 million because we feel it is going to be a lot more expensive than that. And I don't think people should be deluded into thinking this is a simple problem that can be solved overnight. It is going to take a long time, and it is going to take a lot of money. I think we should get started on it right now. But I do not believe that that is the coal industry's responsibility, because the coal industry, as it exists today, had nothing to do with most of those mines.

MR. STEIN: Mr. Garvey, I share your views I think, or your inclination about the money involved. I do believe that these reports that I have heard today have grossly underestimated what the cost is going to be. However, we do have a fundamental problem. This doesn't just relate to your industry where we get an abandoned mine or where we get a sludge bank.

There are several questions here. Did the industry do this in good faith in the past and just leave it there? Do you want to start up a mine and merely be responsible for the increments? Are we to have, as you call it, a "deferred national debt," to be picked up just as a matter of national policy for the Government to pay? Or are we going to make the effort to find an owner who is responsible for the inactive mine and indeed hold him responsible? These questions I think are very much open.

I don't think this entire question is so difficult. But neither is it very easy to solve. If you are going to make the pitch to come up with a policy, Mr. Garvey, my suggestion is that this is so important that it should be solved in another forum -- probably the Congress or something like that. But I don't think this group can make a judgment. It should be either the court or the legislature that solves this question.

**MR. GARVEY:** You are undoubtedly right.

**MR. STEIN:** I think it is a good point. But it is certainly beyond the capabilities of a group like this to deal with a problem like that.

You have to recognize you are not the only industry which may be faced with this kind of problem. For example, we have sludge banks below paper mills or below steel mills, which have existed say for 50 years and have changed hands 20 times. The question is, once you get the mill possibly to put in remedial facilities, you also require it to go downstream and get that material out.

And this is a very tough question that I am not sure we can get to right here.

Now, one other thing bothered me. I didn't quite get your approach that our Nation's affluency did not reach a level that permitted concern about the environment until the mid-1950's. I wonder what Gifford Pinchot and those other people were talking about? You mean we were just baying at the moon until we got to 1950; we couldn't afford it? And if our national product dropped so that we hit another depression, we would have to forget about the environment again?

I know I grew up during the thirties. I hope we never run into times like this again. But are you suggesting if we are not as affluent as the fifties and we have the thirties again, that the country can't afford to worry about the environment?

MR. GARVEY: No, perhaps the use of the word "affluence" was a poor choice. But what I was trying to say is that it wasn't until about the mid-1950's that we began to recognize, I think in this country, that the cost of a product must bear the cost of environmental pollution. And perhaps we have gotten to the point where now we feel we can afford to pay that cost in addition to the direct cost of the product itself.

MR. STEIN: I think I can join with you on your statement with a slight modification. It wasn't until the mid-1950's that the industrial people believed that it was the cost of their product. There were other people who believed that long before and were trying to put that view forward. I think since the mid-1950's — and I agree with this -- we have had a much more cooperative view on the part of industry.

Are there any other comments or questions?

MR. LYON: Mr. Chairman, I am concerned about this last discussion, because you asked Mr. Garvey some questions that really are very unfair. I think as long as we say that we are going to try to look for the guy who originally caused the mine drainage problem, this gives us a good excuse for not doing anything about it. Because the fact of life is that in the fifties, even though the Pinchots and all those other people were there, they were unable — and, by the way, you and I were around, too, in these days — but we were unable to get the legislatures and the Congress to change the law of the land, so that public policy allowed these things to happen. And as long as we continue to try to find the people who caused the damage then, we are not going to get this job done. I simply think we are wasting our time if we think about trying to get the original owners of mines to clean this problem up. They operated under what was then the law of Pennsylvania and even Federal law, and the Federal Government also didn't do much about it then.

I think we ought to let bygones be bygones and try to get the job done.

MR. STEIN: I know what you think. That is very clear.

But let me suggest what the state of the law is. As I say, if we don't do this, I think we are kidding ourselves. As a practical matter, obviously you can move against the active mine owners. As a practical matter too, in the abandoned mines you probably have to undertake this as a public funding program, whether it is State, Federal, or local, for the remedial action to take place.

However, I want to make it clear -- and what I am saying here I think is a matter of law and not what we would think -- but let me divert a minute.

I would like to quote the great Justice Oliver Wendell Holmes, who once said, "You know any bright young boy can tell me what the law ought to be, but it takes a student to say what the law is."

What I am trying to say is that we have this little area -- and it is a real vexing one -- in which industry or we are faced with this in a particular case.

If you have something which was done in the past, and someone feels that they have the evidence to relate that to a responsible party who did that in the past, I do not want anyone to get the notion that the state of the law is such that he is automatically absolved of the responsibility for that, and the program will go ahead without holding him to that.

As a practical matter, I think the bulk of the program, and by far the greatest bulk of the program certainly with abandoned mines, will be done without that. But this does remain a problem. As far as I can see, the only ones who can resolve this are either the Congress or the courts. I know this has come up before. It probably comes up federally in our operation about a dozen times a year. No one has come up with an answer yet that has been able to stick, and I don't want to give you the impression that we are going ahead with it.

In other words, this is going to be one little unresolved area. While in the totality of the problem it may be very small, if this happens to hit your company, it can get to be a big one indeed. The expense of cleaning up what you think you predecessor might have done, or what you might have done back 20 or 30 years ago, might be very expensive.

I hope we are in agreement on this. I am not disagreeing with what you say and the possibility of a practical operation. But this is something that we all should be alert ~~to~~—that we have a little area here that may present some problems. I know that we are going to have people looking for the parties who are responsible for what someone might consider past dereliction, even under modern terms, even though you say that what they were doing at the time was perfectly legitimate and in accordance with usual business practice.

We will recess for 10 minutes.

(Short recess.)

MR. STEIN: Let's reconvene.

The way the schedule looks to us now, we very well may complete the open session today. Then the conferees will reconvene in Executive Session tomorrow, and we should hopefully have an announcement to make by noon. If there is any change in that, as we proceed, I will indicate our best thinking. But it looks as though this is the way it may develop, considering the number of people who have indicated they want to make statements.

Mr. Lyon.

MR. LYON: Mr. Chairman, the next speaker will be Mrs. Pat Newman, who is the president of an organization called GASP -- G-A-S-P -- the organization up until very recently gave all of its energy and dedication to the air pollution problem but has recently also included water pollution in its area of concern.

Mrs. Newman.

STATEMENT OF MRS. PAT NEWMAN, PRESIDENT,
GASP, PITTSBURGH, PENNSYLVANIA

MRS. NEWMAN: GASP, Group Against Smog and Pollution, represents over 60,000 concerned citizens --

MR. STEIN: Ma'am, may we have your full name?

MRS. NEWMAN: Yes. Mrs. John B. Newman.

MR. STEIN: Thank you.

MRS. NEWMAN: -- in and around Allegheny County.

The message I bring to you today is simple. The public is getting wise. A lot of people used to believe that cleanup in air or water means unbearable expense, means loss of jobs. We are learning that, quite to the contrary, pollution brings to the people unbearable expense, and jobs are lost only in a few outdated marginal facilities. Now it is hard to blame that on cleaning up. We know now that polluted water and air are costing us money this very minute.

The committee's report this morning mentioned the

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high cost of polluted water to industry and the high cost of polluted water to cities. Every day we see more cost to private citizens. One of the Nation's top experts in public health pointed out recently that we are wasting millions of dollars a year in hospital expenses and hospital facilities because we are treating people for diseases that are pollution-related. It's like treating a kid that has been beaten up by his father over and over, instead of doing something about the father. We think we better do something about the pollution.

Now this has been said many times, and I don't want to waste time on generalities, but I want to make the point that citizens in general no longer buy the baloney that says we are going to have to spend too much on pollution cleanup. The fact is we are spending too much right now on the effects of pollution.

Now, I don't know how many of you have ever had to answer the question: Why can't we go swimming there, Mommie, or Daddy? Why does that river look so yecchy?

Well, I have had to explain this to a child. I have had to explain that the men who decide that their garbage goes out into our drinking water do not believe in obeying the law.

Yes, there is a law against that I say. But most people figure that the law men, in this case, are really just paper tigers.

We know the rivers can be cleaned up. But the companies don't want to spend the money yet. Now the people are fed up with this. We call for top priority on budgets for enforcement. You can't expect a field representative to go out and do his job when he has got to write up his own business letters; he has got to pull his own files; he can't even get secretarial help. This is what is happening now in the State of Pennsylvania.

We call for effective citizen representation on the remedial committee. This has been discussed, and I think we would support the willingness of the coal industry to have this.

The committee's official report this morning does not include a schedule for cleanup. Later on, the EPA representative mentioned this. We think schedules in all committee reports are of the essence. We see no value at all in a committee report which does not mention when things are going to be done.

We call for the use of economic sanctions in the case of industrial polluters. I have here an Executive Order of President Nixon, dated June 29, 1971, in which it is ordered, in relation to the Clean Air Act, that Government will

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circulate a list of facilities that are in violation of this Act to all governmental Departments, and Agencies shall require before procurement contracts are made or grants are made -- Agencies shall require compliance with the national Clean Air Act.

This seems to me a highly effective way to deal with the problem of companies that feel they don't need to obey the law.

Finally, we remind the conferees that the principal responsibility for the mess that we see in our drinking water, in our waterways, in our swimming places, rests with the companies who derive their profits and their growth from polluting operations.

Therefore, let us remember that the primary cost for cleaning up the mess must be paid by the companies themselves, not by the government and not by the people.

Now we congratulate Mr. Garvey and the coal industry for its compliance and its willingness to cooperate in the case of active mines. We would hate to see undue time taken up with fixing the responsibility for the pollution in the case of inactive mines. However, we can't see his analogy calling this inactive mine problem a "deferred national debt." It seems to me a little like having a lumber company come in here to Mellon Square or out here in these plazas and chop up all of the trees for paper pulp and then ask the people of Pittsburgh to clean up the mess and make it beautiful again.

An equitable solution might be a tax on every ton of new coal taken from the ground to clean up the mess of the past. This is a suggestion we make.

Now, I have two questions to ask. Would that be all right to do now?

MR. STEIN: Go right ahead.

MRS. NEWMAN: I had one to address to Mr. Stein. The official report of the committee, you know, for this conference states that the primary enforcement agency here should be the State. Is it proposed that the budget of the State programs will remain at something like 2 percent of the Federal budget, and that EPA will plan to come in and do the real work?

MR. STEIN: Some of the questions you ask, like that previous one, are not to be directed to this group.

Now, the Federal law provides that the primary rights and responsibilities for pollution control rests with the State. And I think the States here recognize that, and we recognize that.

The question of who is to pay for what is determined in large measure by the Congress and State legislatures. We do have a formula for municipal grant participation that has been worked out. When we deal with industrial wastes, I think the views that you expressed before are the ones that prevail; that is, at least the Federal Government and for the most part for the States. We don't participate; that is an industrial responsibility.

However, we have a very, very special case here where you are getting pollution coming into a stream and where you can't reasonably find anyone who is responsible. That isn't to say that we are at the stage to get into the argument that Mr. Garvey brought forward -- whether you fine someone and he says he shouldn't pay for it or not. Once we have done that, at least you have someone to talk to or proceed against.

I think we just have to face the problem that for the multitude of these abandoned sources, we cannot find anyone to proceed against.

MRS. NEWMAN: No one will deny that.

MR. STEIN: Therefore, we are going to have to find some way of getting the money to pay for it. Now, again, when you talk about -- whatever the proposal -- and yours was a tax on coal possibly --

MRS. NEWMAN: It is a possibility.

MR. STEIN: And Mr. Garvey mentioned we should

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assume that as part of our national debt. It seems whatever the concept -- that kind of concept -- if we are going to get public funds, will have to be considered by your local political subdivisions, the State legislatures, or the Federal legislature -- the Congress.

I don't see how this panel can get to the kind of financing of who is going to bear the brunt of that financing, or the theory that we are going to pay for it. Because, obviously, and I think this relates -- whether it relates to Mr. Lyon or me or the people from West Virginia or Maryland -- you don't go before your legislature and ask for money unless that is included in your chief executor's budget.

Now, therefore, I think we are down to this situation where we all -- I haven't heard any dissent -- agree that the owners or operators should pay for their own cleanup.

Also there is a possibility that with a time schedule, we should come up with priorities and specifics on the closed mines, keeping in mind how much money it is going to cost. I believe with that we will have to go back to our respective governments with the proposals. But I think we have to come up with a technical solution for what your money is going to buy --

MRS. NEWMAN: That is right.

MR. STEIN: -- and when you are going to accomplish it, and what you are going to get when you are through spending the money. And these are the things I think the conference can do by setting up a mechanism.

But I think your question to us about where the money is going to come from is going to ultimately have to be solved by the authorities responsible for appropriating that money.

MRS. NEWMAN: Well, I am not really addressing myself to that. I am addressing myself to something which you said earlier which was that if the State -- correct me if I am wrong -- if the State enforcement program were inadequate, EPA stood ready to come in and save us all from the polluters.

MR. STEIN: I wouldn't say they are inadequate. What I was referring to there were the point sources of active operations. Now, again -- and I don't want to divert this to get off the acid mine operation -- but in the appendixes that Pennsylvania put in, and very properly did, they listed a large number of --

MRS. NEWMAN: I have read it, yes.

MR. STEIN: -- steel companies, glass companies, communities, coal companies, packing companies, etc., One contention they made was: Does treatment meet standards? That contention was made, and in very many of these columns it said yes.

MRS. NEWMAN: Yes.

MR. STEIN: Okay. I think Mr. Lyon pointed out that they had a very limited staff and had to rely on the reports

MRS. NEWMAN: That is right.

MR. STEIN: My answer to that was: If there were any specifics here that anyone believed were not the case, we have a statutory obligation to look into that, and we would do that.

MRS. NEWMAN: How quickly can you act on these? There are many of them. We are familiar with them. How quickly can you act?

MR. STEIN: Again, Mr. Sidio is the Chief of our staff here, and he can tell you this. But I would suggest on these you get your specifics down through Mr. Lyon, and Mr. Cook who is our regional man, and Mr. Sidio, and they will be able to give you the answer on that in specific cases.

Now you know that we do have obligations like this throughout the country, but we schedule these as rapidly as we can, and we will go forward with them.

But I think this is a thing that has to be taken up on a case-by-case basis with them, so they can give you a specific answer.

MRS. NEWMAN: Okay. You have no way of estimating whether it will be 6 months, a year, 2 years —

MR. STEIN: No, it won't be — not that long.

MRS. NEWMAN: I see. Less than that. Well, that is a hopeful note then.

MR. STEIN: Not at all that long.

MRS. NEWMAN: Okay. Thank you.

MR. STEIN: It will be much sooner than that.

MR. COOK: Well, one thing before you leave. One thing I would like to make clear is that the EPA does not have 98 people for every 2 people in the State. We have fewer professional people in the field that we can send out to do this kind of work than practically any of the State agencies that we cover in 6 States. We are down to about 5 or 6 people per State. So we don't have all those **grand** resources that you have heard about.

MRS. NEWMAN: Yes. I am aware of this. I am wondering how far citizens groups can go to help you? We are aware that some of EPA's budgets have been axed, for reasons that are incomprehensible to me. Where can we scream? Where can we help you?

MR. COOK: Well, we respond. Believe me, we respond. If you call us in Charlottesville, Virginia, or our Wheeling field station, you will get a response.

MRS. NEWMAN: I am aware I will get a response. I am looking for a response from the Congress and from President Nixon and from a few other people.

MR. STEIN: Are there any other comments or questions?

Yes.

MR. LYON: Murray, I don't think you really answered Mrs. Newman's question about what you were going to do about the 2 percent. Because you go around the country, and you see that States are undernourished in terms of staff and that they are not adequate, and then you tell them, "the State's work is primary," but at the same time you tell them "if the State doesn't do it, we will be happy to move in."

I have got a very simple question: What are you going to do to get Mr. Ruckelshaus to recommend to Congress that the State's share of the Federal dollar -- which means State program plans -- will be increased significantly?

MR. STEIN: Well, I will tell you what I will do -- and I suggested this in advance. If you have that message, I will be glad to carry that to him and send it up to him.

MR. LYON: Well, I tried to give it to you.

(Laughter)

MR. STEIN: Not only have you tried to give it to me, your message has come through loud and clear. I think I know your views on this, and I dare say Mr. Ruckelshaus may be aware of your views. But we will be glad to give these to him again.

Again, I would like to indicate this -- sometimes you talk like this -- but the question here is that after all, we are all one governemnt, and the people you are dealing with are your representatives as well as mine, and they have made the judgments on these things. And I think most of you are fairly well aware that when we have the allocations of program fund grants to the States, as far as the amount of moneys we put out, we are limited by an appropriation amount plus a formula established by law. In other words, there is very little discretion left to us in the dispensation of those funds. All we do is the arithmetic. By the way, the arithmetic is done according to a formula established by law.

MRS. NEWMAN: Thank you.

MR. STEIN: Thank you.

MR. LYON: The next Pennsylvania speaker -- and I hope you have noticed, Murray, and fellow conferees, the increasingly effective and important role that women are playing in pollution concern in Pennsylvania -- our next speaker is Mrs. Edmund Evey, who is representing the Pennsylvania Federation of Women's Clubs.

Mrs. Evey.

STATEMENT OF MRS. EDMUND H. EVEY, JR.,
CHAIRMAN, ENVIRONMENTAL HEALTH,
PENNSYLVANIA FEDERATION OF WOMEN'S CLUBS,
CAMP HILL, PENNSYLVANIA

MRS. EVEY: Thank you, Mr. Chairman.

I would like to preface my remarks by admitting that an in-depth -- I did not identify myself. I am Mrs. Edmund Evey, Chairman of Environmental Health for the Pennsylvania Federation of Women's Clubs.

I would like to preface my remarks by admitting that an in-depth study of the pollution problems of the Monongahela River Basin has not been conducted by our organization. But as a representative of some 70,000 club women in the State of Pennsylvania, my statement is intended as an indication of the interest and concern of our organization.

Inasmuch as the General Federation of Women's Clubs, some 11 million women around the world, parent organization of the Pennsylvania Federation, passed its first resolution proposing water pollution control in 1900, and has vigorously supported legislation, strict water quality standards, enforcement of such standards, and education of the public regarding all types of pollution. And in keeping with the theme of our President, "A Better Environment," we wish to go on record as favoring Federal, State, and municipal cooperation in solving the problem of acid mine drainage into the Monongahela River and its tributaries. Surely this need has been pointed out today.

We salute the Pennsylvania Department of Environmental Resources for the progress made to date in achieving a 97 percent rate of the active mines in the State of Pennsylvania now meeting the State's effluent standard for drainage control, achieved through a program of field inspections, pollution source inventory, sealing of deep mines, and treatment of drainage by the mines themselves. We urge that if these same strict standards are not present in the other States participating in this conference and members of ORSANCO, that they be adopted. This is perhaps an unfair statement without having heard the testimony of the other States.

We are concerned, however, by the acid mine drainage problems caused by the inactive mines draining into the river. As every homemaker along the banks -- and I am speaking as an individual here -- of the Monongahela can tell you, the excessive hardness of the water has an undesirable effect in the home. We deplore the fact that in some areas of the Monongahela, tests have proven the water unable to meet the United States Public Health Service drinking water standards. We long for that day when the river may support trout and other fish life and be used to a greater extent for recreational purposes.

It is our hope that the recommendations of this conference will be adopted, and vigorously enforced; and that the $500,000 set aside for an economic study of the Monongahela River Basin under the Federal Research and Development Grant be spent to establish a list of priorities for mine drainage abatement in the Monongahela River Basin. We urge cooperation of all the States belonging to ORSANCO and attending this conference in preparing a list of the active and inactive mines in their respective States, and heartily endorse the theory of obtaining for the Monongahela River Basin the maximum water quality improvement for the number of dollars spent.

I would like to close by agreeing with the League of Women Voters, who so ably presented their views, that enforcement of the proposals to come out of this conference is the most essential thing, and that the polluter should be made to pay his share.

And I thank you for the opportunity of presenting the statement.

MR. STEIN: Thank you.

Any comments or questions? Thank you very much.

MR. LYON: Our next Pennsylvania speaker — and I believe the last — is Mr. Greg M. Chaklos, a student reporter from Penn State University.

## STATEMENT OF GREG M. CHAKLOS,
## STUDENT REPORTER, PENN STATE UNIVERSITY,
## PITTSBURGH, PENNSYLVANIA

MR. CHAKLOS: Gentlemen. My name is Greg M. Chaklos, a student at Pennsylvania State University.

Having listened to your discussion, I believe that expeditious action on the Monongahela River pollution abatement situation is an absolute necessity. However, I believe that we have, in some manner, neglected the fact that general industrial effluents also play a major role in the pollution problem of the Monongahela River waterways.

True, it has been said that mine acid damage is an important problem. This I shall not deny. Instead I would say that we have overemphasized the assessed damage instigated by mine acid damage alone, at the price of industrial discharges and uncontrolled sewage.

Furthermore, we have agreed that the major problem here may well be funding of Federal, State, local water pollution control efforts. In relation to that monetary problem, I would recommend that if possible funds appropriated for the U.S. Army Corps of Engineers projects, such as the current 5-year Monongahela River Basin study be reallocated to underwrite the cost of curing all types of pollution in the Monongahela River Basin.

Finally, a question was raised earlier relevant to industrial discharges in the Monongahela River Basin. Mr. Stein mentioned that if the Environmental Protection Agency could be supplied information as to the quality and quantity of industrial discharges into the river as well as their location, then the Environmental Protection Agency would seek corrective action.

Gentlemen, it would seem to me that the regulatory function of the Environmental Protection Agency is to discover every major source of pollution. Moreover, it is the function of this Federal Agency in conjunction with the U.S. Department of Justice to instigate legal actions against alleged defendants.

Gentlemen, I implore you to consider appropriate measures that will achieve the most antipollution activities in the shortest possible time.

In short, this involves a reorganization of priorities by the various governmental agencies, and then instituting action on those priorities. Federal-State action in this day and age of environmental devastation may well be the situation that replaces citizen faith in our form of government.

Thank you.

MR. STEIN: Thank you.

Any comments or questions?

MR. LYON: Mr. Chairman, I would just like to say for the record that Mr. Chaklos has prepared a complete study of one of the suburban or urban tributaries of the Monongahela; that is Turtle Creek. Turtle Creek has some very serious problems -- mine drainage, sediment control, industrial wastes, etc. And we are going to study his report with great interest because we want to do something about Turtle Creek. We are very appreciative.

MR. STEIN: Thank you.

I would like to clarify a point -- and this was made by several speakers at least. I think I got this solidified and stirred up.

My remarks were directed at a list which was appended to a Pennsylvania report. What we generally have done was we have accepted the State reporting to us on industrial conditions and municipal conditions. Some of the people have indicated that possibly this report of Pennsylvania may not be completely up to date or accurate. And Mr. Lyon has indicated that they are very short-staffed.

My remarks were just directed to the notion that if you had a belief that this was the case, we would be happy, as we pointed out, as did Mr. Cook and Mr. Lyon, to check this out and be sure that we were giving full consideration to the industrial sources you pointed out as well as the mine sources.

I think your point is well taken that we are not going to have a cleanup of the river unless we take care of all sources.

MR. CHAKLOS: Well, I wanted to ask you that: if there is a discrepancy in the figures from the State report and the information that is contained therein, wouldn't it be possible, then, for this committee to possibly investigate that?

MR. STEIN: Yes. But the point is: On its face, there is no discrepancy in this report.

MR. LYON: Mr. Chairman, I think we ought to quit kidding ourselves on this subject. Water quality management is a dynamic system. Any facts that you put down in a report are outdated 2 days later. We can go out in a boat today and disprove much of what we have in this report. So let's not play hide-and-seek. Let's agree that unless you have, or we have, or somebody has, people out on that stream all of the time checking, we are going to find that these facts here are incorrect.

So that this is a dynamic thing, and industry may be in compliance today and in violation tomorrow. And we know that if you go out on any stream in Pennsylvania, you will find approximately 20 percent of all of the cases you look at in violation of the law. And we pick up those cases and do something about that, and then some others get into violation.

This is a fact of life, and this is something we are going to have to deal with. The more people we have, the smaller that percentage will get. But with the present staffing, it is about 20 percent -- 20 percent of our cases are in violation at any one time.

MR. STEIN: Are there any other comments or questions?

MR. CHAKLOS: No. Thank you.

MR. STEIN: Thank you very much.

MR. CHAKLOS: Thank you.

MR. STEIN: Mr. Lyon.

MR. LYON: Are there any other people here from Pennsylvania who would like to have an opportunity to speak?

If not, Mr. Chairman, that concludes the presentation.

MR. STEIN: May we now call on Mr. Henry for West Virginia?

STATEMENT OF EDGAR HENRY, CHIEF,
DIVISION OF WATER RESOURCES,
WEST VIRGINIA DEPARTMENT OF NATURAL RESOURCES,
CHARLESTON, WEST VIRGINIA

MR. HENRY: Thank you, Mr. Chairman.

I have been real quiet today, but since I was around in the thirties, I guess that gives me an opportunity to say something.

I would like to introduce the members of the State government that are here today from West Virginia, namely, Mr. Ira S. Latimer, who is Director of our Department of Natural Resources; Mr. Nick Johnson, Assistant Attorney General; Mr. Richard Frum, Federal-State Relations in the Governor's Office; and Mr. G. O. Fortney, Sanitary Engineering Division of the Health Department.

Thank you.

We have, Mr. Chairman, a prepared statement -- unfortunately, we didn't have our copies completed in time to give the necessary copies here today. We will have them in -- since we also have bladder problems -- we will have them in within 7 days, if that is all right.

We have one finished copy and we would like to refine the thing and give it to you.

MR. STEIN: All right. Thank you.

Without objection, that edited copy will appear in the record as if read.

Go ahead.

MR. HENRY: I would make one comment in that our presentation here deals with mine drainage -- mainly mine drainage. We did not go into the other areas as has been gone into today. We have in our statutes areas covering these other areas such as other industrial wastes, municipal wastes, and so on. We dealt here only with mine drainage.

Now, the State of West Virginia has since the 1963 Enforcement Conference on the Monongahela River Basin instigated several measures designed to bring about solutions to the problems of water pollution in the Monongahela River Basin in the State of West Virginia.

One of the major steps taken by the State was the setting of water quality standards for all waters of the State of West Virginia including intra- and interstate waters.

A second major step was the several amendments to the Water Pollution Control Act which became effective in July 1969. As it relates to mine drainage, the new Act specifically covers the opening, reopening, operating, or abandoning of coal and other mines. These activities now require water pollution control permits from the Division of Water Resources of the Department of Natural Resources for all of these activities.

In advancing its efforts towards pollution abatement, the State of West Virginia has initiated a watershed cleanup approach in dealing with mine drainage and other pollution sources. To demonstrate the technique, the State has initiated a demonstration project in the Dents Run watershed which is near Morgantown in the Monongahela River Basin. This project is the first in the Nation to receive a demonstration grant from the EPA in this specific authorization.

The Division of Water Resources, Department of Natural Resources joined with EPA in a joint study of the State's water pollution control effort. The State is currently carrying out the priority recommendations in the report in that the funding of the pollution control agency

-- and that is State funding for fiscal 1972 to provide for additional personnel for this program.

Since the Monongahela River Enforcement Conference in December 1963, the State of West Virginia has provided active participation on the Technical Committee of the Remedial Project. It has assisted in the project in several areas of endeavor; namely, representation on the Technical Committee which was established by the conferees, assistance and services in the computer program for the sampling program, and provision of the site for the Norton Acid Mine Drainage Demonstration Project near Elkins, West Virginia.

Since the conference in December 1963, the State of West Virginia's accomplishments can be summarized as follows:

1. Development of a permit system specifically spelled out by statute for the opening, reopening, operating, and abandoning of mines. This is an ongoing program enabled by legislation in 1969. (See Article 5A, Section 6, of Attachment I, pp. 219-233.)

2. Installation of 19 treatment facilities in the Monongahela River Basin for the treatment of mine drainage from active mines. (See Attachment II, pp. 234-236.)

3. Establishment of water quality standards for all inter- and intrastate waters in the State. The interstate standards have been now fully approved by the

Environmental Protection Agency. (See Attachment III, pp. 237-261.)

4. Served on Technical Committee and assisted in development of the committee reports.

5. Established a demonstration project for the treatment and control of mine drainage on Dents Run near Morgantown, West Virginia, in the Monongahela River Basin.

6. Established field offices, one of which is in the Monongahela Basin at Fairmont, West Virginia, to provide overall water pollution control surveillance in the assigned area.

7. Participated in two comprehensive studies under the U.S. Corps of Engineers; namely, the Ohio Basin Comprehensive Study and the Water Development Coordinating Committee for Appalachia, both of which dealt with the Monongahela River Basin and mine drainage pollution.

8. We have initiated a Type 4 study in mid-1970, in cooperation with the U.S. Department of Agriculture, to cover and carry out detailed studies of the Monongahela River Basin in West Virginia.

9. Conducted a joint study with EPA to present an appraisal of the State's pollution control program. The report emphasizes the areas of need in all phases of pollution control.

Our conclusions and recommendations are as follows:

E. Henry

Conclusions

It is the position of the State of West Virginia that it has advanced significantly in its pollution abatement program, especially as it relates to mine drainage from active mines, and that it is adequately prepared to carry out an effective program of pollution abatement in the area of mine drainage from active mines.

Recommendations

The recommendations include that the following be adopted as the basis for correction of the mine drainage problem in the Monongahela River Basin.

1. That the problem of mine drainage from inactive mines be considered as a national problem.

2. That the information collected during the period following the December 1963 Conference be assembled and developed in such a manner so as to enable development of the most effective program for mine drainage pollution abatement from abandoned mines, and in this area we do not advocate study and more study; we advocate the installation of facilities to treat the mine drainage.

3. That the program for abandoned mine drainage pollution abatement be funded by the Federal Government to bring about reductions in pollution loads consistent with established water quality standards or such effluent

standards that may be necessary to either maintain or where necessary enhance water quality of the intra- and interstate streams.

4. We wish the Appalachian Regional Commission, on behalf of the States involved in the Monongahela Basin, to develop a summary paper identifying all activities being undertaken by the Federal and State Governments in connection with pollution control abatement and environmental improvement in the Monongahela River Basin. We believe this is necessary because of the multitude of activities already under way or about to get under way.

The Appalachian Regional Commission, working through the individual States, should submit to the States and all other appropriate conferees, an analyses of these activities together with suggestions for carrying out a more effective and better coordinated overall approach to the problem of the basin.

It is only practical to recognize that there are other interested parties involved in the overall activity, and that these ongoing efforts should be recognized and incorporated into the total design.

We make particular reference to: 1) the Southern Regional Environmental Conservation Council, which is developing a compact that would permit legal and binding

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agreement for studies which should be considered in future undertakings; and 2) the Ohio River Basin Commission, a State-Federal body, which all of the States in this Monongahela River Basin are members, that has specific assignments in the planning and construction of projects within the Ohio Basin.

We note that the Environmental Protection Agency, under instructions from Congress, has transferred $500,000 in funds to the Appalachian Regional Commission to refinance the preparation of a broad framework within which our anti-pollution activities, with special reference to mine drainage pollution, might proceed.

In this light, the emphasis should be in the area of pollution from abandoned mines in both the development and subsequent funding of such a program. For this reason, and also because the Commission uniquely involves both the States and the Federal Government in a broader program affecting the basin, we believe that the States working through the ARC -- the Appalachian Regional Commission -- are best equipped to prepare these recommendations. With this appraoch, the States would supervise and make the policy particularly with regard to those activities to be undertaken within their respective boundaries. The Appalachian Regional Commission would undertake these activities only with the approval of the individual States and only with the mutual approval of the States operating autonomously and individually.

Following receipt of these recommendations, the States and Federal agencies involved will have made and can continue to make intelligent decisions concerning our future course of action in the Monongahela Basin.

And I thank you.

MR. STEIN: Thank you, Mr. Henry, for a very comprehensive statement.

Are there any comments or questions?

A copy of the recommendations will be mailed to the conferees.

Are there any questions or comments?

I just have one, Mr. Henry. You indicated you had 19 treatment facilities.

MR. HENRY: Yes, sir.

MR. STEIN: In the Monongahela is that?

MR. HENRY: That's right.

MR. STEIN: What would you think you would have to have with those active mines — or how many treatment facilities before West Virginia would be completed on the goal?

MR. HENRY: You are talking about active —

MR. STEIN: Yes.

MR. HENRY: -- mines?

MR. STEIN: I think the 19 applies to the active mines.

MR. HENRY: That's right.

MR. STEIN: That's right. I just wanted to get an idea of how far along we are -- about.

MR. HENRY: I would say we are about 1/3 of the way there.

MR. STEIN: In other words, you would estimate that about 60 --

MR. HENRY: Yes.

MR. STEIN: -- would be needed, give and take a few.

MR. HENRY: Right. And these vary in size. Sorry I didn't have the handout. We have a map locating these, and we have the size of the facility and what the facility is for, whether it is a neutralization, aeration, sedimentation, and also the daily flow of water.

MR. STEIN: Now, the Federal recommendation -- the reason I raised that, again, this is for the consideration of the West Virginia people. They are suggesting 6 months for meeting certain specifications.

If you have 40 facilities to go, I suggest you give that careful consideration before we get into that Executive Session. I am just trying to get the dimensions of the problem.

MR. HENRY: We have given it consideration. We have also given consideration to the reporting frequency, asking that we give certain reports quarterly. I didn't mention, but we are participating in the STORET program with the EPA, and it seems to me that they could put the card in and get the answer out as quickly as we could, because it's their system anyway. So you are going to have the data whenever you want it. You don't have to wait for a quarterly report.

MR. STEIN: I am just raising these points for consideration.

But, again, I think the time schedule, as has been pointed out by several of the witnesses here, is going to be crucial. If you are about 1/3 up on your control of your active mines and have 2/3 to go, we want to again be realistic if you are talking about a 6-month deadline on this. And we would like to have your comment on that after you talk to your colleagues.

MR. HENRY: Yes, sir.

MR. STEIN: Thank you very much.

Are there any other comments or questions?

If not, thank you.

May we go to Maryland now?

MR. HENRY: Pardon me.

MR. STEIN: I am sorry.

MR. HENRY: Believe it or not, some other people get out of West Virginia besides us, and I have two people here.

MR. STEIN: Great.

MR. HENRY: I have a Mr. Charles R. Jenkins. He is President of the West Virginia Division of the Izaak Walton League, who would like to make a statement.

## STATEMENT OF CHARLES R. JENKINS,
## PRESIDENT, WEST VIRGINIA DIVISION OF THE
## IZAAK WALTON LEAGUE OF AMERICA,
## MORGANTOWN, WEST VIRGINIA

MR. JENKINS: Thank you, Mr. Henry.

Mr. Chairman, conferees. I want to thank you for this opportunity to present some of our views regarding the Monongahela River.

Our organization is made up of 25 chapters and 8 of these chapters are located in the Monongahela Basin. We do support efforts aimed toward making the Monongahela once

C. Jenkins

again a productive stream. We have long deplored the lack of wastewater treatment by many municipalities and industrial plants located within the basin. It is extremely frustrating to realize that if the wastes from these municipalities and industries received 100 percent treatment the Monongahela would remain barren due to acid mine drainage.

Water is one of the essential ingredients for life, and here we have a stretch of water a few hundred miles long, but it is about as ecologically complex as a desert -- at least over many stretches of the stream.

To the layman, the enormity of this problem seems more like something out of science fiction, unreality. But we do know what the problem is. It is acid mine drainge. We know where the mines are located. A survey was completed in 1968 I believe as to where these mines were, and we know methods for abating much of the problem. But what is being done with the problem? Sometimes it seems as though nothing is.

We are talking about it. We started talking in 1963, and here 8 years later we are still talking about it. Why is it that it has taken so long to get from talk A to talk B? Your report says that this survey was completed in 1968, but here it is 1971 when we finally meet again.

We support action by the Federal Government to clean up pollution, but please let's have action.

Since the acid drainage problem is so large with respect to the inactive mines, we urge that a Federal Public Works program be established to clean up this problem in the Monongahela drainage. The U.S. Army Corps of Engineers has considerable technical capabilities to direct such a program, and I would think that such a program would have a wide-based support compared to programs such as the controversial Rowlesburg dam project. Let's invest our dollars in projects that will benefit almost everyone living in the basin and not just those far downstream.

Such a Public Works project would cost millions of dollars. Millions of dollars, much of it public financing, has already been invested in waste treatment facilities -- mostly municipalities. This money has generally been spread around with no -- or at least very few -- streams actually being recovered. The layman begins to wonder can a polluted stream really be recovered or reclaimed? Should a Public Works program that we have suggested be undertaken, we urge that significant sub-basins of the Monongahela River be selected for concentrated effort so that after X-millions of dollars have been invested, we can see Y-miles of clean streams. Show us some results and not just reports of dollars invested.

Thank you, again, for this opportunity to express some of our views.

MR. STEIN: Thank you, Mr. Jenkins.

Are there any comments or questions?

If not, thank you very much.

Mr. Henry.

MR. HENRY: Mr. Chairman, I have one more statement. A gentleman had to leave and asked that this be entered into the record -- Reverend Knauff, K-n-a-u-f-f.

MR. STEIN: Without objection, this will be done. I think most of the conferees have seen this statement.

This will be entered as if read.

(The document above referred to follows in its entirety.)

OHIO VALLEY ENVIRONMENT COUNCIL

O.V.E.C.

Sponsored by the Jefferson County T.B. & Health Association

P.O. Box 399 Phone 282-7431 Steubenville, Ohio

Ben Weber, President
Joseph Loha, V. Pres.

Kathleen Sousa, Sec'y
Laura Tweed, Treasurer

Waste disposal should be a legitimate cost of production. It should not be treated in a manner different from any other legitimate cost. This should be made national policy and our industrial leaders should accept this principle. They are not the only ones entitled to use our water resources. The public has a right to pure drinking water. Citizens have a right to recreational uses of waterways.

Our rivers and lakes belong to all Americans. They were not meant to be the private dumping rounds for industrial concerns. Since they are in the public domain, the public has a right to charge those who despoil them and to spend the money collected on restoring the quality of the water. There is no reason why all Americans should be made to bear the cost of cleaning up water which industry has used without any charge or penalty in additional taxes to carry away its waste products.

Each pollutor must be assessed and charged with penalties in substantial sums based on the quantity of the waste discharged, and also on its relative strength and toxicity.

Rev. J. Lowell Knauff
228 Fernwood Ave
Weirton, W. Va 21062

MR. HENRY: Thank you, Mr. Chairman. That concludes the West Virginia portion of the presentation.

MR. STEIN: Thank you.

We will now call on the Virginia delegation — I mean Maryland. Sorry. I thought we were back on the Potomac.

STATEMENT OF PAUL W. McKEE, DIRECTOR,
MARYLAND DEPARTMENT OF WATER RESOURCES,
ANNAPOLIS, MARYLAND

MR. McKEE: The afternoon is getting late, Mr. Chairman.

Mr. Chairman, my name is Paul McKee, and I am Director of the Maryland Department of Water Resources. With me here at the conference table is Mr. Howard Chaney from the Maryland Department of Health; and in the audience I have one of my staff members, Mr. Michael Rodevick, the District Engineer in this area that we are concerned with today.

The Maryland Department of Water Resources is responsible for enforcement of laws (Article 96A of the Annotated Code of Maryland) relating to the pollution of the waters of the State of Maryland. This authority includes the control of pollution due to mine drainage and sedimentation from mining operations.

The Department of Water Resources regulations define mine effluents from strip as well as deep mines as being industrial discharges and, therefore, subject to all industrial discharge requirements. During the active mining operations, the mines are regularly inspected by personnel of the Department to ascertain their compliance with the water quality standards. Where necessary, the operators are required to construct and maintain adequate treatment facilities. Upon failure to comply with orders, the violation is referred to the Attorney General for enforcement in the courts.

Maryland has also a statewide facility control law specifically applying to the mining of coal, and requires the mine operator to prepare a plan for sediment and erosion control, submit this plan to the Soil Conservation District for review and approval prior to obtaining a permit to remove coal from that operation. This particular program in Maryland became effective in July of last year -- July 1 of 1970.

Regarding surface mining only or strip mining only, the State of Maryland has a program under the Land Reclamation Committee. This, too, became effective several years ago. The committee is composed of representatives of the Department of Water Resources, Fish and Wildlife Administration, Department of Forest and Parks, Maryland Geological Survey, and the Bureau of Mines, and Soil Conservation Districts of the two counties in which coal is mined in Maryland.

The committee reviews applications for permits to strip mine and must approve these applications prior to the Bureau of Mines being authorized to issue permits to mine coal. The procedure of the Land Reclamation Committee is to ascertain if measures proposed by the operator are adequate for environmental control as well as the control of discharges to comply with water quality standards.

Prior to permit issuance, the mining operator must post a reclamation bond of $400 per acre, a revegetation bond of $50 to $125 per acre of affected land, and a $30 per acre donation for the reclamation and revegetation of strip operations that were in effect prior to this law. Failure to comply with the conditions imposed by the Land Reclamation Committee or by the Bureau of Mines results in the revocation of the mining permit, and may result in the revocation of the operator's license.

Legislation is currently being considered, but at the present time there is no provision in State law to enable the State to compel a deep mine operator to prevent pollution after the deep mining operation is completed and abandoned.

However, effective on July 1, 1970, the Abandoned Mine Drainage Control Act was passed and authorized the Secretary of Natural Resources to take all actions necessary to abate the pollution resulting from abandoned mines. This legislation also authorized a $5 million bond issue to finance this program.

The implementation of the Abandoned Mine Drainage Control Program has been assigned to the Department of Water Resources. The Department has conducted a survey to locate all coal mining operations in the State. The status of mines and their locations have been kept up to date through active mine inspections carried out by the Department. The first three priority areas in the Abandoned Mine Reclamation Program are within Maryland's portion of the Monongahela River Basin. These are: Cherry Creek, Casselman River, the Northern Youghiogheny complex. Aerial photograph and photographic interpretation of these priority areas is complete, and consultants have been recommended to the Board of Public Works to carry out the detailed surveys and feasibility studies. Contracts for these surveys and studies are expected to be executed in the very near future.

Upon completion of the surveys and studies under the direction of the Maryland Department of General Services, the land will be acquired and the recommended abatement measures will be designed and constructed. When the abatement measures are completed in the priority areas, the program will be implemented in other areas affected by abandoned mine drainage.

Mr. Chairman, we have some thoughts regarding recommendations to the conference. I do not have them in any really prepared form but I will have them for you sometime tomorrow.

MR. STEIN: I would suggest, again, that if you don't put them forward here, you may want to discuss this with the other conferees tonight as we leave, so they will have thought these over tomorrow and this will expedite the Executive Session. The sooner we get these out the better we will be.

MR. McKEE: Mr. Chairman, this State conference is already scheduled for this evening.

MR. STEIN: All right. We encourage caucuses. Good.

Are there any comments or questions?

If not, thank you very much, Mr. McKee.

Mr. Chaney, do you want to make a statement?

MR. CHANEY: I have no statement to make. I concur with Mr. McKee's comments.

MR. STEIN: That is great.

Are there any other people from Maryland you want to call on?

MR. McKEE: Not to my knowledge, Mr. Chairman.

MR. STEIN: Thank you very much. We appreciate this.

Now, we have ORSANCO, Mr. Horton.

STATEMENT OF ROBERT K. HORTON,
EXECUTIVE SECRETARY, OHIO RIVER VALLEY
WATER SANITATION COMMISSION,
CINCINNATI, OHIO

MR. HORTON: Mr. Chairman. Thank you. I will try to be as brief as I can. I do have a statement here. I want to get back to the report of the Technical Committee for a couple of reasons. First of all, it is the basis for the reconvening of this conference; and, secondly, a letter of mine, dated December 26, 1969, has been referred to several times, and I want to make my position as set forth in that letter clear.

As has been reported, ORSANCO participated with Pennsylvania, West Virginia, and Maryland in the work of the Technical Committee, the task of which, as has been reported, was to determine sources, types, and amounts of pollution from coal-mining operations in the **Monongahela Basin along with means and cost estimates for abating such pollution.**

Now, as a member of the Technical Committee, we met at frequent intervals over a period of years to advise the technical staff on procedures, assembly of data, and the preparation of progress reports and recommendations.

Now, from our standpoint, we believe that the EPA staff team -- that was the technical staff that served the Technical Committee -- we believe that the work of that staff was performed in a most creditable and praiseworthy manner. I really think they did a magnificent job of locating sources of mine drainage and in determining the amounts, character, and extent of pollutional discharges, and in developing estimates of cost for the abatement of such pollution.

As our Chairman said this morning, let us look at the positive side of that report. There is a wealth of information in there. And commenting on that, I might say that the short summary report that was given to us this morning by Mr. Sidio, in my view, hardly does justice to the skill and the conscientious effort of the EPA staff that carried out the elaborate field and laboratory investigations that are embodied in the full report. But even though the summary report is a short one, it does contain basic data on the nature and scope of the mine drainage pollution problem, and I think it provides a basis from which we can proceed.

Now, having said this, I would like to comment briefly on what I consider to be some of the limitations of the report, and these are the comments that were set forth in my letter of December 1969, and it was at that time that the committee was attempting to finalize its recommendations for submission back to the conferees.

Now, some of the points that were made in that letter have been mentioned already today. I would like to just touch on four of the points that I made in the letter.

The first one -- and Mr. Lyon referred to this, this morning -- I stated that: "The report" -- that is the report of the Technical Committee -- "as it now stands is deficient in not recommending priorities for undertaking specific abatement projects should funds for this purpose be made available. Neither does the report offer guidelines of criteria to be considered in establishing priorities. These are matters that" -- in our view -- "are inherent in the charge of the Technical Committee, which, among other things, included instructions to develop a remedial program."

Now, the second point that I made -- in spite of

R. Horton

that limitation -- I believe that the information is there, and I went on to say that: "One basis for establishment of priorities would be inclusion in the report of an economic analysis" of relative costs of abatement in the various sub-basins arranged in some order of priority on the basis of unit costs.

And to illustrate this, I extracted some of the data in the report, which I will not read, but it is set up in a table which shows for various sub-basins certain items. One was listed in the report as "cost for remedial measures." For example, the cost listed in the report for the Upper Youghiogheny was $67,000; the cost for Buckhannon was $1,300,000. It is that kind of thing. You get some sort of range.

Also in the report they give information on the pounds of acid discharged, points of iron -- that is by each sub-basin -- then the cost for removal of acid and iron -- for one pound of acid a day or a pound of iron a day. And then perhaps most important, included in that report, is information showing cost for improvement of one mile of stream.

For example, the Upper Youghiogheny is listed at $1,300 cost for improving one mile of stream. For the Upper Tygart, the cost for one mile of stream is listed as $21,000. Well, here again, we have a range, and it seems to me that with a little study of these figures, you could get some feel for priorities or where to start. And I think this was a point that our Chairman touched on this morning.

I went on to say in the letter: "There is another kind of evaluation that (in my view) should also be made. For each sub-basin, (it seems that) a determination should be made of the number of sources of drainage requiring remedial measures for incremental reductions in acid loads." Say, what would it cost to remove 50 percent of the acid, or 80 percent, or 90 percent? This is a kind of evaluation, again, that I believe could be made rather quickly and would provide information on which we could start some remedial work if money were available.

I also said that: "Apart from ... these additional economic appraisals, our principal reaction to the ... reports is that more needs to be said regarding changes in stream quality characteristics that may be expected as a result of corrective programs. For example, analyses on conductance, hardness and sulfate levels indicate that some of the streams have very little buffering capacity. On these streams ... there might be some question as to whether proposed remedial measures will bring about a significant improvement in ..." quality levels, say, as measured by pH.

But, here again, I think the basic information is there, and it could be put into usable form I believe in very short order.

I made two other points in the letter. One was this: "The Technical Committee can hardly afford not to include in its report consideration of the findings set forth in the Appalachian Regional Commission study on mine drainage control, which have been presented to Congress. Specifically, how may these findings" -- of ARC -- "be dovetailed into ..." any Monongahela program that might be recommended or undertaken by the conferees?

And the last point in my letter was this: "If a recommendation is made that $5 million be allocated for remedial work, the recommendation should be supported with substantive details and carry with it an explanation of precisely what is to be accomplished by such an expenditure."

These are the points I made in the letter, Mr. Chairman, and I wanted them clarified, and hopefully they may be useful to the conferees in weighing the merits of what next should be done.

Now on another matter and with respect to alternative possibilities for conduct of an action program, thinking now of the kind of institutional arrangement or arrangements that might be set up, I went to the staff and asked for their views, and particularly I solicited the views of Edward Cleary, who was my predecessor as a member of the Technical Committee.

He developed a memorandum which isn't very long, Mr. Chairman, in cooperation with other members of the staff, and with your permission, I would like to have that statement read into the record, and I would like to ask Mr. Robert Boes of our staff to read that statement if I may.

MR. STEIN: Surely.

I wish you would convey our thanks to Mr. Cleary, and you know we have worked together through the years and we always appreciate his advice.

MR. HORTON: Thank you very much.

MR. BOES: Mr. Chairman, conferees, ladies and gentlemen. The statement is as follows:

For almost half a century investigations have been under way to define the magnitude and deleterious effects of acid mine drainage in the Ohio Valley. The document prepared for the reconvened Monongahela conference reflects the results of one of the most recent and painstaking investigations of this kind in the Monongahela River Basin.

However, and in common with virtually all other studies on the mine drainage problem, the recommendations accompanying the Monongahela report provide few clues on

R. Horton

what kinds of institutional arrangements might be devised to foster execution of remedial measures. We believe the question of basic concern to the conferees must be: What choices exist in terms of administrative machinery for more effective conduct of mine-drainage control?

One suggestion concerning this question has been offered in the report submitted to the conference. That is to establish a committee whose function would be "to direct and coordinate" the activities of the numerous State, regional, and Federal Governmental entities that have some relationship with pollution control or mining operations.

It is highly improbable that a committee can exercise operational control over a group of agencies whose responsibilities and authority are diffused. Quite aside from this shortcoming, the suggested arrangement ostensibly does not envision participation of those directly involved in the cause and prevention of the pollution, namely, the coal-mine operators.

It appears that the conferees might be encouraged to explore alternative arrangements for expediting comprehensive action projects. Existing arrangements on the State, regional, and Federal levels of government, as well as within the mining industry, fall short of providing an operational mechanism suitably responsive to the social, economic, technologic and legal aspects of mine drainage control.

Deficiencies that now exist suggest that any new mechanism for accelerating action programs should satisfy the following requisites:

1. It should be given responsibility for control of all mine drainage within a watershed or a portion thereof, and conceivably it would embrace sediment control and solid waste disposal from mining operations.

2. It should be broadly empowered to plan, finance, design, construct, and operate whatever facilities would contribute most effectively in meeting State and Federal Water Quality Standards.

If agreement can be reached on these basic jurisdictional and operational functions then a wide range of alternative administrative approaches could lay claim for consideration. Among them, for example, would be the use of organizations patterned after conservancy districts, watershed authorities, sanitation and drainage districts. Experiences with each of these institutional arrangements reveals that they can be flexibly adapted to perform regional service functions.

Legislative sanction for establishment of these kinds of institutions should offer no problem because in one form or another they have already been given trial for other purposes in the States represented at the conference. Indeed, Maryland possesses additional and unique legislation whereby the State itself (under the auspices of a new agency called the Maryland Environmental Service) can finance, design, construct, and operate facilities for control of all liquid wastes that may enter its waterways.

Another alternative -- and one which could intimately and desirably involve the private sector in remedial action activities -- encompasses the formation of publicly franchised mine drainage control "cooperatives." Envisioned here is a type of corporate entity in a watershed (or portion thereof) whose role would be to undertake the financing, design, construction, and operation of whatever facilities and services that may be found appropriate for comprehensive mine drainage control. Members of the cooperative organization would include mine operators and State representatives. The organization would be concerned with abandoned mines as well as with active mines.

Voting privileges and funding responsibilities of such an organization could be prorated among the members in accordance with the quantity and pollutional characteristics of drainages and such other factors as might have a bearing on the installation and operation of control measures.

It is not suggested that any one of this array of institutional options -- or others that may be advanced -- should be regarded as the exclusive choice for every circumstance. Different watersheds and local conditions may command preference for a specific type of organization. The point to be emphasized is that enough options ought to be weighed and their merits and limitations defined so that decisions can be made from a variety of choices.

Lacking such an evaluation of institutional options that may be exploited, the conferees would deprive themselves of an unusual opportunity to foster new ways of tackling a problem that thus far has not satisfactorily yielded to approaches used up to this time.

That is the end of the statement.

MR. STEIN: Thank you.

Any comments or questions?

Before we go into that, Mr. Horton, do you want your written statement incorporated into the record or just as you read it?

MR. HORTON: I gave her a copy of the written statement.

MR. STEIN: And you want it -- without objection that will be entered into the record as if read.

MR. HORTON: Right.

MR. STEIN: Okay.

(The statement above referred to follows.)

OHIO RIVER VALLEY WATER SANITATION COMMISSION

Monongahela River Conference
August 24-25, 1971

Statement by Robert K. Horton,
Executive Director and Chief Engineer of ORSANCO

Following the initial session of the Monongahela River Conference on December 17-18, 1963, the Ohio River Valley Water Sanitation Commission (ORSANCO) became a member,. along with West Virginia, Pennsylvania, Maryland and the FWPCA, of a technical committee to guide the activities of a Monongahela River Mine Drainage Remedial Project.

Establishment of the committee effectuated a major recommendation of the conferees. The task assigned to the technical committee was to determine the sources, types and amounts of pollution from coal mining operations in the Mon basin along with means and cost estimates for abating such pollution.

For this purpose a project office was financed and staffed by the FWPCA at Wheeling, West Virginia. The technical committee met at frequent intervals over a period of years to advise on procedures, assembly of data and the preparation of progress reports and final recommendations.

From the standpoint of the ORSANCO representative on the committee, in the person of the executive director and chief engineer, the FWPCA staff team on this project performed most creditably in locating sources of mine drainage and in determining the amounts, character and extent of pollutional discharges, and in developing estimates of cost for the abatement of such pollution.

A summarization of the results of this work is contained in the report which has been distributed for this conference. The modest size of this report hardly does justice to the input of skill and conscientious effort of the FWPCA staff that carried out the elaborate field and laboratory investigations from which the results were compiled.

In brief, the conferees have before them a document of definitive basic data on the nature and scope of the mine drainage pollution problem.

Having said this, I would like to point out what I consider to be certain limitations of the document. These comments, incidentally, will not be unfamiliar to my colleagues on the technical committee. In December 1969, when the committee sought to finalize recommendations to be incorporated in the report, I felt compelled to adopt a minority position.

The position I took was set forth in a letter of December 26, 1969. From this letter I would like to quote the following excerpts:

1. The report as it now stands is deficient in not recommending priorities for undertaking specific abatement projects should funds for this purpose be made available. Neither does the report offer guidelines or criteria to be considered in establishing priorities. These are matters that are inherent in the charge to the Technical Committee, which, among other things, included instructions to develop a remedial program.

2. One basis for establishment of priorities could be inclusion in the report of an analysis of relative costs of abatement in the various sub-basins, arranged in some order of priority on the basis of unit costs.

   To illustrate, a review of the data for some of the sub-basins produces the following unit costs:

| | Upper Youghiogheny | Dunkard Creek | Middle Fork | Upper Tygart | Buckhannon |
|---|---|---|---|---|---|
| Cost for remedial measures | $ 67,500 | $ 275,000 | $302,500 | $395,000 | $ 1,300,000 |
| Pounds of acid discharged | 1,561 | 7,950* | 5,579 | 19,656 | 4,059 |
| Pounds of iron discharged | 263 | 1,675** | 157 | 917 | 1,123 |
| Miles of stream to be improved | 50 | 28 | 24 | 12.5 | |
| Cost for removal of 1 lb/day of acid | $ 40 | $ 35 | $ 54 | $ 20 | $ 320 |

* 52,070 x 15% (from inactive mines)
** 11,154 x 15% (from inactive mines)

| | Upper Youghiogheny | Dunkard Creek | Middle Fork | Upper Tygart | Buckhannon |
|---|---|---|---|---|---|
| Cost for removal of 1 lb/day of iron | $ 256 | $ 164 | $ 1,940 | $ 480 | $ 1,160 |
| Cost for improvement of 1 mile of stream | $ 1,350 | $ 9,900 | $12,800 | $21,600 | |

There is another kind of evaluation that should also me made. For each sub-basin, a determination should be made of the number of sources of drainage requiring remedial measures for incremental reductions in acid loads (say 50%, 80%, and 90%), together with an estimate of the costs involved with each increment. This kind of evaluation will show where the greatest return can be obtained for a dollar spent.

Apart from the need for these additional economic appraisals, our principal reaction to the sub-basin reports is that more needs to be said regarding changes in stream quality characteristics that may be expected as a result of corrective programs. For example, analyses on conductance, hardness and sulfate levels indicate that some of the streams have very little buffering capacity. On these streams, therefore, there might be some question as to whether proposed remedial measures will bring about a significant improvement in pH levels.

3. The Technical Committee can hardly afford not to include in its report consideration of the findings set forth in the Appalachian Regional Commission study on mine drainage control, which have been presented to Congress. Specifically, how may these findings be dovetailed into the Monongahela program?

4. If a recommendation is made that 5 million dollars be allocated for remedial work, the recommendation should be supported with substantive details and carry with it an explanation of precisely what is to be accomplished by such an expenditure.

I offer these views because I believe that the conferees at this meeting may find them useful in weighing the merits of what next should be done.

With respect to alternative possibilities for conduct of an action program I solicited the views of Edward J. Cleary, who was my predecessor as a member of the technical committee during the first two years of its deliberations. Dr. Cleary, who now serves as a consultant to the Ohio River Valley Water Sanitation Commission, wrote a memorandum from which I will read and attach to my statement.

Mr. Cleary says:

Memorandum
OHIO RIVER VALLEY WATER SANITATION COMMISSION
414 WALNUT STREET CINCINNATI, OHIO 45202

TO: Robert K. Horton, Executive Director and Chief Engineer

FROM: Edward J. Cleary, Consultant -- August 20, 1971

RE: Viewpoints on the Monongahela Conference

For almost half a century investigations have been underway to define the magnitude and deleterious effects of acid mine drainage in the Ohio Valley. The document prepared for the reconvened Monongahela conference reflects the results of one of the most recent and painstaking investigations of this kind in the Monongahela River basin.

However, and in common with virtually all other studies on the mine drainage problem, the recommendations accompanying the Monongahela report provide few clues on what kinds of institutional arrangements might be devised to foster execution of remedial measures. Yet, I believe, the question of basic concern to the conferees must be: What choices exist in terms of administrative machinery for more effective conduct of mine-drainage control?

Only one suggestion concerning this question has been offered in the Monongahela report. And that is to establish a committee whose function would be "to direct and coordinate" the activities of the numerous state, regional and federal governmental entities that have some relationship with pollution-control or mining operations.

It is highly improbable that a committee can exercise operational control over a group of agencies whose responsibilities and authority are diffused. Quite aside from this shortcoming, the suggested arrangement ostensibly does not envision participation of those directly involved in the cause and prevention of the pollution, namely, the coal-mine operators.

## Essentials of a management mechanism

It appears to me that the conferees might be encouraged to explore a number of alternative arrangements for expediting comprehensive action projects. Existing arrangements on the state, regional and federal levels of government, as well as within the mining industry, fall short of providing an operational mechanism suitably responsive to the social, economic, technologic and legal aspects of mine drainage control.

Deficiencies that now exist suggest that any new mechanism for accelerating action programs should satisfy the following requisites:

1. It should be given responsibility for control of all mine drainage within a watershed or a portion thereof, and conceivably it would embrace sediment control and solid-waste disposal from mining operations.
2. It should be broadly empowered to plan, finance, design, construct and operate whatever facilities would contribute most effectively in meeting state and federal water-quality standards.

## A variety of options

If agreement can be reached on these basic jurisdictional and operational functions then a wide range of alternative administrative approaches could lay claim for consideration. Among them, for example, would be the use of organizations patterned after conservancy districts, watershed authorities, sanitation and drainage districts. Experiences with each of these institutional arrangements reveals that they can be flexibly adapted to perform regional service functions.

Legislative sanction for establishment of these kinds of institutions should offer no problem because in one form or another they have already been given trial for other purposes in the states represented at the conference. Indeed, Maryland possesses additional and unique legislation whereby the state itself (under the auspices of a new agency called the Maryland Environmental Service) can finance, design, construct and operate facilities for control of all liquid wastes that may enter its waterways.

Another alternative -- and one which could intimately and desirably involve the private sector in remedial-action activities -- encompasses the formation of publicly franchised mine-drainage control "cooperatives." What I envision here is a type of corporate entity in a watershed (or portion thereof) whose role would be to undertake the financing, design, construction and operation of whatever facilities and services may be found appropriate for comprehensive mine drainage control. Members of the cooperative organization would include the mine operators and a state representative of the state whose concern would embrace abandoned mines.

Voting privileges and funding responsibilities of the cooperative organization could be pro-rated among the members in accordance with a formula that took into account the quantity and pollutional characteristics of the drainage and such other factors as may have a bearing on installation and operation of control measures. Provision would be made for eligibility of the entity to receive such state, regional and federal financial assistance as may be determined to be appropriate in the furtherance of its objectives.

It is not suggested that any one of this array of institutional options -- or others that may be advanced -- should be regarded as the exclusive choice for all and every circumstance. Different watersheds and local conditions may command preference for a specific type of organization. The point to be emphasized is that enough options ought to be weighed and their merits and limitations defined so that a variety of choices can be offered.

Lacking such an evaluation of the institutional options that may be exploited the conferees would deprive themselves of an unusual opportunity to foster new ways of tackling a problem that thus far has not satisfactorily yielded to conventional approaches.

EJC/rb
8/20/71

MR. LYON: Mr. Chairman, I think Mr. Cleary's memorandum and also Mr. Horton's statement contribute a great deal to our consideration of this problem, and give us a great deal of food for thought. I completely share Mr. Horton's view, and his fairly detailed proposition regarding the establishment of priorities as we have said earlier.

Regarding the institutional arrangements questioned, we have so far not found this to be a problem in Pennsylvania. Our Department designs, constructs, and operates, and maintains these facilities. Under the new Federal regulation which requires comprehensive basin, metropolitan and regional planning (Regulation 18 CFR 601) in our compliance program we have submitted to EPA, we have included mine drainage as one of the elements of our waste management plans. I foresee that there will be many opportunities for us to blend together industrial waste treatment and sewage treatment where it is economic and wise to do so. So that we agree that this institutional question should be given some consideration, and in terms particularly of the economics, but it certainly is not a major obstacle.

Thank you.

MR. STEIN: Are there any other comments or questions?

I think, Mr. Horton, if you get to that State caucus tonight, as I think you might, you may take those points you made in your letter in transforming this report into an action program. I think they are all designed to do that, and certainly the conference is open to the suggestions on how we can go forward with this, and come up with priorities within an agreed-upon time hopefully.

I think your second point possibly merits -- maybe I will take a number off that because you made several -- your last point about putting the money tag on it, it might be advisable to come up with a specific project or a list of projects or proposals. Then put the money on that -- rather than come up with a monetary figure first and then come up with the projects later.

MR. HORTON: Fine, Mr. Chairman, I would like to discuss it, and I don't want to prejudge it or be pessimistic. But, as I did say and as I think Mr. Lyon indicated this morning, I feel that this is a staff job to select areas of immediate attack, but let us kick it around anyhow.

MR. STEIN: I am not saying that. Let me try to do this. If it is a staff job, we should indicate this and give the staff a deadline --

MR. HORTON: Right.

MR. STEIN: -- to come up with specific proposals.

MR. HORTON: 'Wonderful.

MR. STEIN: But I think if this is the case, then it would seem to me -- and I just give you these for your consideration -- the question of how much each one is going to cost will have to be determined on the proposals that the staff comes up for 1, 2, 3, 4. Is that correct?

MR. HORTON: Right.

MR. STEIN: Right. Now, also I would suggest -- and I think Dr. Cleary's suggestion on these institutional arrangements is very pertinent, and it sure rings a bell, but I think the conferees should also come to a judgment whether this is something that can be handled within each State. If it is handled within Pennsylvania and Maryland and possibly West Virginia, this is something we should allow the States to operate on and just in terms of the conference talk about remedial programs and time schedules.

MR. HORTON: Right.

MR. STEIN: And possibly confine ourselves to that unless this proves to be insurmountable. I am afraid unless there is a real reason that the States can't handle that themselves, we may be enticed into a thicket that the conferees might be well advised to stay out of.

MR. HORTON: I get your point.

MR. STEIN: Right.

Are there any --

MR. COOK: I was going to invite Bob Horton to my caucus, Murray.

Seriously, if you do need a meeting room large enough, you might contact Bill Riley over here. We have a room that perhaps you would want to use for your meeting tonight.

MR. STEIN: Do you have anyone else you want to invite to speak?

MR. HORTON: No, Mr. Chairman.

MR. STEIN: Does this conclude the panel's presentation?

Does anyone in the audience want to say something?

I should indicate that this may conclude the opportunity for participation by the public. If you have anything to say, you feel something is left unsaid, this is the time to make your wishes known.

If not, let me announce what we intend to do tomorrow. We will reconvene in Executive Session in the next room -- in the King's Terrace -- at 9:00 o'clock. Is that all right? And we will have an announcement to make in here at 11:30 tentatively. If we cannot make that time, we will send word out. But I hope with the efforts that have been put on this, and the conference discussions as they developed, it seems to me we have large areas of unanimity, and I would hope that we would be able to come forward with an announcement here at 11:30 tomorrow. I would hope to see many of you people back, but those who won't come back I want to thank you all for participating. I think you have helped us in developing the problem and showing the way toward possible solutions of the problem, and I am very hopeful that we are going to be able to come up with meaningful conclusions and recommendations tomorrow.

As is our custom, what we do is: The conclusions and recommendations will be read and distributed. After they are read and distributed, we will remain availabl . But you can break up with any individual conferee and if they are available, you can ask them questions or make comments on what was done.

With that, we will stand --

MR. McKEE: May we have a clear statement of those people who can participate in the Executive Session? I think of staffs of conferees who are here, whether you want them in the Executive Session or not. I think this is a decision that we ought to make.

MR. STEIN: I don't want to make an arbitrary rule on that. If you are going to caucus tonight -- and we have generally done this just before we have the Executive Session we have 2-1/2 hours. The more people you bring into the room the slower this is going to be.

Let me suggest that in the State caucus tonight you decide how many people you want to bring in, and we will bring in a commensurate number of Federal people -- not to outvote you, but we will consider ourselves just one conferee. (Laughter)

In other words, we won't overwhelm you with this, but I think you can decide this tonight.

MR. McKEE: Mr. Chairman, I think you will find it very difficult to overwhelm us.

MR. STEIN: Well, not if we have a one-man one-vote operation. You heard what Mr. Lyon said about the resources.

But why don't you decide that, and I think you people have all been in these Executive Sessions with us before. I ask you all to exercise restraint in the number of people you are going to bring in, and the reason I do that is just the question of time more than anything else. The more people, it is going to take you longer.

All right.

MR. McKEE: Mr. Chairman, there is a question.

MRS. WALSH: I just wanted to inquire: may one call down here to get a message, say, at 10 of 11:00 as to whether you are actually ready to go 11:30?

MR. STEIN: Yes, you may. Yes. Do we have a phone? The King Terrace Room -- you call there, and we will answer the phone and you can get this.

I am very confident the way this conference is going that we will be ready to go about half past 11:00. In other words, I am reasonably sure we are going to be able to come to an agreement.

MR. McKEE: Can I modify my airplane reservations?

MR. STEIN: Yes. You know, Paul, if you modify your airplane trip, I am sure we are going to get out on time.

With that we will stand recessed; 9:00 o'clock Executive Session, 11:30 open session.

(Whereupon, the conference adjourned at 5:05 p.m.)

- - -

(The recommendations of the conferees and appended material follow.)

MONONGAHELA ENFORCEMENT CONFERENCE
August 25, 1971

## Recommendations

1. The State and interstate conferees recognize that the abandoned mine drainage problem is primarily a regional development matter. The State and interstate conferees request that the Applachian Regional Commission direct and coordinate with the Environmental Protection Agency and other appropriate agencies the abatement program recommended by the conferees.

2. The State and interstate conferees recommend that the Applachian Regional Commission be charged with but not limited to the following responsibilities:

   (a) to develop within 3 months, methods to assign priorities;

   (b) to establish within 9 months, priorities for areas or sub-basins in accordance with the methods developed;

   (c) to evaluate progress and accomplishments of existing abatement projects to advance and refine abatement technology;

   (d) to prepare within 15 months more finite estimates on the cost of high priority projects;

   (e) to determine and develop financial assistance required to carry out high priority abatement projects;

   (f) prepare semiannual progress reports for submission to the States and ORSANCO.

3. The State and interstate conferees recommend that the Applachian Regional Commission cooperate with the Environmental Protection

Agency in accomplishing the assigned responsibilities.

4. All the conferees recommend that a legal study be financed by the EPA covering an analysis of legal problems in abatement and control of water pollution from mining and associated functions. Model legislation be developed based on:

- (a) a study of patterns of ownership of mineral rights in the basin.
- (b) a study of possible State legislation aimed at determining methods to:
    1. obtain right of entry for reclamation work.
    2. assure public benefit from reclamation work.

5. All the conferees recommend that the Environmental Protection Agency adopt a nationwide policy to include in its standards program the abatement and prevention of pollution from active mines no later than September 1, 1972. By September 1, 1972, all waters discharged from all active mines in the Monongahela Basin shall meet the following criteria or the State water quality standards, whichever is more restrictive: pH between 6 and 9 standard units; no net acidity as determined by Standard Methods; and total iron concentration of 7 milligrams per liter or less. Discharges from facilities to abate pollution from inactive mines shall meet water quality criteria.

6. All the conferees recommend that the conferees meet quarterly until September 1, 1972. At these quarterly meetings, conferees

will receive and review progress reports on all activity in the basin. At the September 1, 1972, meeting, the conferees will decide whether to recommend termination of the conference.

7. The Federal conferee recommends that all mine operators are immediately to institute procedures to control and prevent sedimentation in the watercourses.

8. The Federal conferee recommends that all mine operators opening new mines or expanding mines already in operation shall abate water pollution both during mine operation and after mining activity has ceased. Abatement plans shall be submitted to the appropriate State agency 6 months prior to commencement of mining. Mining activities shall not begin until the State agency has reviewed and approved the plan.

9. The Federal conferee recommends that each State shall report quarterly to the conferees:

(a) a list of new and reopened mines;

(b) a list of active existing mines which became inactive during the quarter;

(c) the status of actions to control pollution from the closed mines.

DEPARTMENT OF DEFENSE UNITED STATES OF AMERICA

DEPARTMENT OF THE ARMY
PITTSBURGH DISTRICT, CORPS OF ENGINEERS
FEDERAL BUILDING, 1000 LIBERTY AVENUE
PITTSBURGH, PENNSYLVANIA 15222

ORPDE

27 August 1971

Mr. William T. Riley
Chief, Enforcement Branch
EPA, Region III
918 Emmet Street
Charlottsville, Virginia 22901

Enforcement Conference;
Monongahela River and its Tributaries

Dear Mr. Riley:

I am submitting, attached, a brief account of my oral statement, as promised Mr. Murray Stein, who chaired the EPA Enforcement Conference, Monongahela River and Its Tributaries, held at Pittsburgh, Pennsylvania, on 24 and 25 August 1971.

The Technical Committee's report to the conferees is a fine piece of work, even though it only calls for a very broad program rather than hard action. I wish that the Corps of Engineers had been more actively involved in the preparation of the Summary Report on the Monongahela River Mine Drainage Remedial Project. However, the important consideration now is the need for an action program to match the excellence of the Technical Committee's investigative work. That is the essence of my attached statement.

I appreciate the invitation and opportunity to attend the conference as a representative of an organization interested in the environment, and submit my statement within the seven-day limitation imposed by Mr. Stein. I shall appreciate EPA consideration and evaluation of my offer to participate in furtherance of your program to abate the mine drainage problem in the Monongahela River Basin.

I also respectfully confirm my specific oral request to Mr. Stein, after the meeting, to make me a member of the conference. Surely the Pittsburgh District will be involved in any major construction undertaken by the Federal government to abate mine drainage pollution in the Monongahela River Basin. If so, we should be deeply involved as early in the program as possible. Already, we have eight years to catch up on. Further, I believe we can make a very meaningful, substantive contribution.

ORPDE
Mr. William T. Riley

27 August 1971

The many courtesies extended to me by Mr. Stein during the meeting are deeply appreciated. He conducted an outstanding show under difficult circumstances.

Sincerely,

E C West

1 Incl
As stated

E. C. WEST
Colonel, Corps of Engineers
District Engineer

## STATEMENT TO CONFEREES

I am Colonel Edward C. West, District Engineer, Army Corps of Engineers, Pittsburgh Engineer District.

After reviewing the Mine Drainage Report to conferees prepared by the Technical Committee of the Enforcement Conference, I am here to discuss with you the important consideration which relates to "who does what to whom, now." I can only compliment the Technical Committee on a fine piece of work. However, the difficulty of the committee will now be to come up with a concrete plan of action. Some action is required now to do the work involved.

Although for some reason, now immaterial, the Corps of Engineers was not actively involved in the organization of the conference at its inception in 1963, we now find ourselves in the position of observing the initiation of a tremendous program in which I feel that the Corps has a definite interest, and possibly an important role to play. In any event, the Technical Committee report, presented by Mr. Andrew Sidio, in its recommendations calls for an action program which is obviously required to do the job and to meet the desires (and demands) of the public.

I realize that many coordination problems exist because of my awareness of concurrent and related investigative programs and studies which are currently under way in the Monongahela Basin by the state agencies of West Virginia and Pennsylvania. The State of West Virginia is preparing a Type IV study in cooperation with the United States Department of Agriculture. The Commonwealth of Pennsylvania has completed its Phase I study and Report on a Mine Drainage Remedial Project for the Youghiogheny River Basin, and is continuing toward an implementation program. The Pittsburgh District is also actively involved in bringing toward construction the Stonewall Jackson Lake and the Rowlesburg Lake projects, both in West Virginia. On the latter, we are experiencing some environmental interest resistance, and have presently in progress an environmental study of the Cheat River Basin. Also, we are considering a broad based water quality study for the purpose of satisfying the State of West Virginia, particularly in response to the requirements which have been outlined by one of the conference conferees, Mr. Edgar Henry. The Corps is also presently conducting the Monongahela-Youghiogheny River Basin Study, which will include a pertinent analysis of the Monongahela River Basin mine drainage problem, and potential abatement programs. In this regard, we are also considering a joint government-industry request for development of a mine drainage program in the Irwin, Pennsylvania, area which would use treated mine drainage as a source of public water supply for that area of the Monongahela River Basin.

I am really making the point that the Corps of Engineers, as a public service agency, now actively engaged in reestablishing its future planning, estimating, engineering, construction and funding capabilities (the strengths of our Civil Works organization) could very well play a major role in your Monongahela River Mine Drainage Remedial Project. Consequently, we ask a rhetorical question---where do we fit into the program? It is suggested that EPA and the Corps of Engineers are the most effective agencies for doing the job.

It is academic as to which agency will chair this effort, although we offer to be the lead agency. However, we wish to be on record that we are prepared to accomplish any specific mission, or the overall mission involved. We await your decision as to which way to go.

## ADDENDUM

Congressman James Fulton and Colonel West respectfully recommend inclusion of the Saw Mill Run and Chartiers Creek drainage basins in the area to be considered in the action program for abating mine drainage pollution. (Both streams are tributary to the Ohio River only a short distance below the "Point" at Pittsburgh, and their proximity to the Monongahela Basin suggests the reasonableness of their inclusion in the program.)

Edward C West

Attachment I

## WATER POLLUTION CONTROL ACT

CHAPTER 20 — ARTICLE 5A

WEST VIRGINIA CODE
AS AMENDED 1969

DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WATER RESOURCES

CHARLESTON, WEST VIRGINIA
25305

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## WATER POLLUTION CONTROL ACT

**20-5A-1. Declaration of policy.**

It is declared to be the public policy of the State of West Virginia to maintain reasonable standards of purity and quality of the water of the State consistent with (1) public health and public enjoyment thereof; (2) the propagation and protection of animal, bird, fish, aquatic and plant life; and (3) the attraction, development, maintenance and expansion of agriculture, mining, manufacturing and other business and industry.

**20-5A-2. Definitions.**

Unless the context in which used clearly requires a different meaning, as used in this article:

(a) "Director" shall mean the director of the department of natural resources;

(b) "Board" shall mean the state water resources board;

(c) "Chief" shall mean the chief of the division of water resources of the department of natural resources;

(d) "Person", "persons" or "applicant" shall mean any public or private corporation, institution, association, firm or company organized or existing under the laws of this or any other state or country; State of West Virginia; governmental agency; political subdivision; county court; municipal corporation; industry; sanitary district; public service district; drainage district; soil conservation district; watershed improvement district; partnership; trust; estate; person or individual; group of persons or individuals acting individually or as a group; or any other legal entity whatever;

(e) "Water resources", "water" or "waters" shall mean any and all water on or beneath the surface of the ground, whether percolating, standing, diffused or flowing, wholly or partially within this State, or bordering this State and within its jurisdiction, and shall include, without limiting the generalty of the foregoing, natural or artifical lakes, rivers, streams, creeks, branches, brooks, ponds (except farm ponds, industrial settling basins and ponds and water treatment facilities), impounding reservoirs, springs, wells and watercourses;

(f) "Pollution" shall mean (1) the discharge, release, escape, deposit or disposition, directly or indirectly, of treated or untreated sewage, industrial wastes, or other wastes, of whatever kind or character, in or near any waters of the State, in such condition, manner or quantity, as does, will, or is likely to (A) contaminate or substantially contribute to the contamination of any such waters, or (B) alter or substantially contribute to the alteration of the physical, chemical or biological properties of any of such waters, if such contamination or alteration, or the resulting contamination or alteration where a person only contributes thereto, is to such an extent as to make any of such waters (i) directly or indirectly harmful, detrimental or injurious to the public health, safety and welfare, or (ii) directly or indirectly detrimental to existing animal, bird, fish, aquatic or plant life, or (iii) unsuitable for present or future domestic, commercial, industrial, agricultural, recreational, scenic or other legitimate uses; and shall also mean (2) the discharge, release, escape, deposit, or disposition, directly or indirectly of treated or untreated sewage, industrial wastes or other wastes, of whatever kind or character, in or near any waters of the State in such condition, manner or quantity, as does, will, or is likely to reduce the quality of the waters of the State below the standards established therefor in the rules and regulations of the board;

(g) "Sewage" shall mean water-carried human or animal wastes from residences, buildings, industrial establishments or other places, together with such ground water infiltration and surface waters as may be present;

(h) "Industrial wastes" shall mean any liquid, gaseous, solid or other waste substance, or a combination thereof, resulting from or incidental to any process of industry, manufacturing, trade or business, or from or incidental to the development, processing or recovery of any natural resources; and the admixture with such industrial wastes of sewage or other wastes, as hereinafter defined, shall also be considered "industrial wastes" within the meaning of this article;

(i) "Other wastes" shall mean garbage, refuse, decayed wood, sawdust, shavings, bark and other wood debris and residues, sand, lime, cinders, ashes, offal, night soil, silt, oil, tar, dyestuffs, acids, chemicals, and all other materials and substances not sewage or industrial wastes which may cause or might reasonably be expected to cause or to contribute to the pollution of any of the waters of the State;

(j) "Establishment" shall mean an industrial establishment, mill, factory, tannery, paper or pulp mill, mine, colliery, breaker or mineral processing operation, quarry, refinery, well, and each and every industry or plant or works or activity in the operation or process of which industrial wastes, or other wastes are produced;

**(k) "Sewer system" shall mean pipelines or conduits, pumping stations, force mains and all other constructions, facilities, devices and appliances appurtenant thereto, used for collecting or conducting sewage, industrial wastes or other wastes to a point of disposal or treatment;**

**(l) "Treatment works" shall mean any plant, facility, means, system, disposal field, lagoon, pumping station, constructed drainage ditch or surface water intercepting ditch, diversion ditch above or below the surface of the ground, settling tank or pond, earthen pit, incinerator, area devoted to sanitary landfills, or other works not specifically mentioned herein, installed for the purpose of treating, neutralizing, stabilizing, holding or disposing of sewage, industrial wastes or other wastes or for the purpose of regulating or controlling the quality and rate of flow thereof;**

**(m) "Disposal system" shall mean a system for treating or disposing of sewage, industrial wastes, or other wastes, or the effluent therefrom, either by surface or underground methods, and shall be construed to include sewer systems, the use of subterranean spaces, treatment works, disposal wells and other systems;**

**(n) "Outlet" shall mean the terminus of a sewer system or the point of emergence of any water-carried sewage, industrial wastes, or other wastes or the effluent therefrom, into any of the waters of this State;**

**(o) "Activity" or "activities" shall mean any activity or activities for which a permit is required by the provisions of section five (§ 20-5A-5) of this article;**

**(p) "Disposal well" shall mean any well drilled or used for the injection or disposal of treated or untreated sewage, industrial wastes or other wastes into underground strata;**

**(q) "Well" shall mean any shaft or hole sunk, drilled, bored or dug into the earth or into underground strata for the extraction or injection or placement of any liquid or gas, or any shaft or hole sunk or used in conjunction with such extraction or injection or placement. The term "well" shall not have included within its meaning any shaft or hole sunk, drilled, bored or dug into the earth for the sole purpose of core drilling or pumping or extracting therefrom potable, fresh or usable water for household, domestic, industrial, agricultural or public use; and**

**(r) "Code" shall mean the Code of West Virginia, one thousand nine hundred thirty-one, as amended.**

### § 20-5A-3. General powers and duties of chief of division and board with respect to pollution.

(a) In addition to all other powers and duties of the chief of the department's division of water resources, as prescribed in this article or elsewhere by law, the chief, under the supervision of the director, shall have and may exercise the following powers and authority and shall perform the following duties:

(1) To encourage voluntary cooperation by all persons in controlling and reducing the pollution of the waters of this State, and to advise, consult and cooperate with all persons, all agencies of this State, the federal government or other states, and with interstate agencies in the furtherance of the purposes of this article, and to this end and for the purpose of studies, scientific or other investigations, research, experiments and demonstrations pertaining thereto, the department may receive moneys from such agencies, officers and persons on behalf of the State. The department shall pay all moneys so received into a special fund hereby created in the state treasury, which fund shall be expended under the direction of the chief solely for the purpose or purposes for which the grant, gift or contribution shall have been made;

(2) To encourage the formulation and execution of plans by cooperative groups or associations of municipal corporations, industries, and other users of waters of the State, who, jointly or severally, are or may be the source of pollution of such waters, for the control and reduction of pollution;

(3) To encourage, participate in, or conduct or cause to be conducted studies, scientific or other investigations, research, experiments and demonstrations relating to water pollution, and the causes, control and reduction thereof, and to collect data with respect thereto, all as may be deemed advisable and necessary to carry out the purposes of this article;

(4) To study and investigate all problems concerning water flow, water pollution and the control and reduction of pollution of the waters of the State, and to make reports and recommendations with respect thereto;

(5) To collect and disseminate information relating to water pollution and the control and reduction thereof;

(6) To develop a public education and promotion program to aid and assist in publicizing the need of and securing support for pollution control and abatement;

(7) To sample ground and surface water with

sufficient frequency to ascertain the standards of purity or quality from time to time of the waters of the State;

(8) To develop programs for the control and reduction of the pollution of the waters of the State;

(9) To exercise general supervision over the administration and enforcement of the provisions of this article, and all rules, regulations, permits and orders issued pursuant to the provisions of this article;

(10) In cooperation with the college of engineering at West Virginia University, to conduct studies, scientific or other investigations, research, experiments and demonstrations in an effort to discover economical and practical methods for the elimination, disposal, control and treatment of sewage, industrial wastes, and other wastes, and the control and reduction of water pollution, and to this end, the chief may cooperate with any public or private agency and receive therefrom, on behalf of the State, and for deposit in the state treasury, any moneys which such agency may contribute as its part of the expenses thereof, and all gifts, donations or contributions received as aforesaid shall be expended by the chief according to the requirements or directions of the donor or contributor without the necessity of an appropriation therefor, except that an accounting thereof shall be made in the fiscal reports of the department;

(11) To require the prior submission of plans, specifications, and other data relative to, and to inspect the construction and operation of, any activity or activities in connection with the issuance and revocation of such permits as are required by this article, or as he deems necessary to carry out the provisions of this article or to carry out the rules and regulations adopted pursuant to the provisions of this article; and

(12) To require any and all persons directly or indirectly discharging, depositing or disposing of treated or untreated sewage, industrial wastes, or other wastes, or the effluent therefrom, into or near any waters of the State or into any underground strata, and any and all persons operating an establishment which produces or which may produce or from which escapes, releases or emanates or may escape, release or emanate treated or untreated sewage, industrial wastes or other wastes or the effluent therefrom, into or near any waters of the State or into any underground strata, to file with the division of water resources such information as the chief may require in a form or manner prescribed by him for such purpose, including, but

not limited to, data as to the kind, characteristics, amount and rate of flow of any such discharge, deposit, escape, release or disposition.

(b) In addition to all other powers and duties of the water resources board, as prescribed in this article or elsewhere by law, the board shall have and may exercise the following powers and authority and shall perform the following duties:

(1) To cooperate with any interstate agencies for the purpose of formulating, for submission to the legislature, interstate compacts and agreements relating to the control and reduction of water pollution; and

(2) To adopt, modify, repeal and enforce rules and regulations, in accordance with the provisions of chapter twenty-nine-A (§ 29A-1-1 et seq.) of this Code, (A) implementing and making effective the declaration of policy contained in section one (§ 20-5A-1) of this article and the powers, duties and responsibilities vested in the board and the chief by the provisions of this article and otherwise by law; (B) preventing, controlling and abating pollution; and (C) establishing standards of quality for the waters of the State under such conditions as the board may prescribe for the prevention, control and abatement of pollution.

(c) The board is hereby authorized to hire one or more individuals to serve as hearing examiners on a full or part-time basis. Such individuals may be attorneys at law admitted to practice before any circuit court of this State. All such hearing examiners shall be individuals authorized to take depositions under the laws of this State.

(d) The board, or any member thereof, and the chief, and their duly authorized representatives, shall have the power and authority to make investigations, inspections and inquiries concerning compliance with the provisions of this article, or any order made and entered in accordance with the provisions of this article, or any rule or regulation promulgated by the board, or with the terms and conditions of any permit issued in accordance with the provisions of section seven (§ 20-5A-7) of this article. In order to make such investigations, inspections and inquiries, the board, or any member thereof, and the chief, and their duly authorized representatives, shall have the power and authority to enter at all reasonable times upon any private or public property, subject to responsibility for their own safety and for any damage to the property entered. All persons shall cooperate fully with the person entering such property for such purposes. Upon refusal of the person owning or controlling such property to permit such entrance or the making of such inspections, investigations and inquiries, the board or any member thereof or the chief may apply to the circuit court of the county in which such property is located, or the judge thereof in vacation, for an order authorizing such entrance and the making of such inspections, investigations and inquiries; and jurisdiction is hereby conferred upon such court or judge to enter such order upon a showing that the relief asked is necessary for the proper enforcement of this article. A dwelling occupied for residential purposes shall not be entered without a search warrant.

(e) The board is hereby authorized and empowered to investigate and ascertain the need and factual bases for the establishment of public service districts as a means of controlling and reducing pollution from unincorporated communities and areas of the State, and to present reports and recommendations thereon to the county courts of the areas concerned, together with a request that such county courts create a public service district or districts, as therein shown to be needed and required and as provided in article thirteen-A (§ 16-13A-1 et seq.), chapter sixteen of this Code. In the event a county court shall fail to act to establish a county-wide public service district, the board shall act jointly with the state director of health, the director of the department of natural resources and the chief of the division of water resources to order the county court to take action to establish such public service district or districts as may be necessary to control, reduce or abate the pollution, and when so ordered the county court members must act to establish such a county-wide public service district.

**20-5A-3a. Standards of water quality.**

(a) In order to carry out the purposes of this article, the board may promulgate rules and regulations setting standards of water quality to be applicable to the waters of this State, which standards of quality shall be such as to protect the public health and welfare, wildlife, fish and aquatic life, and the present and prospective future uses of such waters for domestic, agricultural, industrial, recreational, scenic and other legitimate beneficial uses thereof.

(b) In establishing, amending, revising or repealing rules and regulations relating to water quality standards, the board shall follow all relevant procedures provided by article three (§ 29A-3-1 et seq.), chapter twenty-nine-A of the Code.

(c) All persons affected by rules and regulations establishing water quality standards shall promptly comply therewith: Provided, that where necessary and proper, the chief may specify a reasonable time for persons not complying with such standards to comply with such standards, and upon the expiration of any such period of time, the chief shall revoke or modify any permit previously issued which authorized the discharge of treated or untreated sewage, industrial wastes or other wastes into the waters of this State which result in reduction of the quality of such waters below the standards established therefor by rules and regulations of the board.

### § 20-5A-4. Cooperation with other governments and agencies.

The division of water resources is hereby designated as the water pollution control agency for this State for all purposes of federal legislation and is hereby authorized to take all action necessary or appropriate to secure to this State the benefits of said legislation. In carrying out the purposes of this section, the chief is hereby authorized to cooperate with the federal water pollution control administration of the United States department of interior, other agencies of the federal government, other states, interstate agencies and other interested parties in all matters relating to water pollution, including the development of programs for controlling and reducing water pollution and improving the sanitary conditions of the waters of the State; to apply for and receive, on behalf of this State, funds made available under the aforesaid federal legislation on condition that all moneys received from any federal agency as herein provided shall be paid into the state treasury and shall be expended, under the direction of the chief, solely for purposes for which the grants shall have been made; to approve projects for which applications for loans or grants under the federal legislation are made by any municipality (including any city, town, district or other public body created by or pursuant to the laws of this State and having jurisdiction over the disposal of sewage, industrial wastes or other wastes) or agency of this State or by any interstate agency; and to participate through his authorized representatives in proceedings under the federal legislation to recommend measures for the abatement of water pollution originating in this State. The governor is hereby authorized, in his discretion, to give consent on behalf of this State to requests by the secretary of the United States department of interior to the attorney general of the United States for the bringing of actions for the abatement of such pollution. Whenever a federal law requires the approval or recommendation of a state agency or any political subdivision of the State in any matter relating to the water resources of the State, the director, subject to approval of the legislature, is hereby designated as the sole person to give the approval or recommendation required by the federal law, unless the federal law specifically requires the approval or recommendation of some other state agency or political subdivision of the State.

### 20-5A-5. Prohibitions; permits required.

(a) It shall be unlawful for any person, unless he holds a permit therefor from the department, which is in full force and effect, to:

(1) Allow sewage, industrial wastes, or other wastes, or the effluent therefrom, produced by or emanating from any establishment to flow into the waters of this State;

(2) Make, cause or permit to be made any outlet, or substantially enlarge or add to the load of any existing outlet, for the discharge of sewage, industrial wastes, or other wastes, or the effluent therefrom, into the waters of this State;

(3) Acquire, construct, install, modify or operate a disposal system or part thereof for the direct or indirect discharge or deposit of treated or untreated sewage, industrial wastes, or other wastes, or the effluent therefrom, into the waters of this State, or any extension to or addition to such disposal system;

(4) Increase in volume or concentration of any sewage, industrial wastes or other wastes in excess of the discharges or disposition specified or permitted under any existing permit;

(5) Extend, modify or add to any establishment, the operation of which would cause an increase in the volume or concentration of any sewage, industrial wastes or other wastes discharging or flowing into the waters of the State;

(6) Open, reopen, operate or abandon any mine, quarry or preparation plant, or dispose of any refuse or industrial wastes or other wastes from any such mine or quarry or preparation plant: Provided, that the department's permit shall only be required wherever the aforementioned activities cause, may cause or might reasonably be expected to cause a discharge into or pollution of waters of the State; or

(7) Operate any disposal well for the injection or reinjection underground of any industrial wastes, including, but not limited to, liquids or gases, or convert any well into such a disposal well or plug or abandon any such disposal well.

(b) Where a person has a number of outlets emerging into the waters of this State in close proximity to one another, such outlets may be treated as a unit for the purposes of this section, and only one permit issued for all such outlets.

### § 20-5A-6. Form of application for permit; information required; fees.

The chief shall prescribe a form of application for all permits for any activity specified in section five (§ 20-5A-5) of this article relating other than solely to sewage. The director of the division of sanitary engineering of the state department of health, in cooperation with the chief, shall prescribe a form of application for all permits for any activity relating solely to sewage. All applications for permits for any activity relating other than solely to sewage shall be submitted to the chief of the division of water resources, and those applications for permits for any activity relating solely to sewage shall be submitted to the division of sanitary engineering of the state department of health. All applications must be submitted on a form as prescribed above. An applicant shall furnish all information reasonably required by any such form, including without limiting the generality of the foregoing, a plan of maintenance and proposed method of operation of the activity or activities. Notwithstanding anything in this article to the contrary, where the activity is an integral part of a secret operating process, the required information shall be limited solely to data which will show the kind, characteristics, amount and rate of flow of sewage, industrial wastes, or other wastes, or the effluent therefrom, into the waters of the State. Until all such required information is furnished, an application shall not be considered a complete application.

A filing fee of ten dollars shall accompany the application when filed with the division of water resources. The filing fee shall be deposited in the state treasury to the credit of the state general fund. The filing fee shall not be returned to the applicant.

### 20-5A-7. Procedure concerning permits required under article; transfer of permits.

(a) The director of the division of sanitary engineering shall promptly make his determination concerning the health aspects of any proposed activity relating solely to sewage. If the plans and specifications of the proposed activity are in accord with all reasonable requirements of the department of health, the director of the division of sanitary engineering shall approve the application and issue the department of health's certificate or permit

therefor. If the application is approved, the director of the division of sanitary engineering shall promptly forward his department's certificate or permit, together with the application and the information and data submitted therewith, to the division of water resources for the action of the chief thereof. Any denial of the application by the director of the division of sanitary engineering shall be governed by the provisions of chapter sixteen (§ 16-1-1 et seq.) of this Code and not by the provisions of this article.

(b) The chief or his duly authorized representatives shall conduct such investigation as is deemed necessary and proper in order to determine whether any such application should be granted or denied. In making such investigation and determination as to any application pertaining to any activity specified in subdivision (7) of subsection (a) of section five (§ 20-5A-5) of this article, the chief shall consult with the director of the state geological and economic survey and appropriate officials of the state department of health, and all such persons shall cooperate with the chief and assist him in carrying out the duties and responsibilities imposed upon him under the provisions of this article and the rules and regulations of the board; such cooperation shall include, but not be limited to, a written recommendation approving or disapproving the granting of the permit and the reason or reasons for such recommendation.

(c) The department's permit shall be issued upon such reasonable terms and conditions as the chief may direct if (1) the certificate or permit of the department of health was issued (in those cases where the director of the division of sanitary engineering was required to act as required in subsection (a) hereof); and (2) the application, together with all supporting information and data and other evidence, establishes that any and all discharges, or releases, escapes, deposits, disposition of treated or untreated sewage, industrial wastes, or other wastes, or the effluent therefrom, resulting from the activity or activities for which the application for a permit was made will not cause pollution of the waters of this State or violate any rules and regulations of the board: Provided, that the chief may issue a permit wherever in his judgment the water quality standards of the State may be best protected by the institution of a program of phased pollution abatement which under the terms of the permit may temporarily allow a limited degree of pollution of the waters of the State; and (3) in cases wherein it is required such applicant shall include the name and address of the responsible agent as set forth in section eight-b (§ 20-5A-8b) of this article.

(d) An application for a permit incident to remedial action in accordance with the provisions of section eleven (§20-5A-11) of this article shall be processed and decided as any other application for a permit required under the provisions of section five (§20-5A-5) of this article.

(e) An application for any permit shall be acted upon by the chief, and the department's permit delivered or mailed, or a copy of any order of the chief denying any such application delivered or mailed to the applicant by the chief within forty-five days after the date upon which such application was received from the applicant by the division of sanitary engineering where the application relates solely to sewage or within thirty days after the date upon which such application was received from the applicant by the division of water resources in all other cases.

(f) When it is established that an application for a permit should be denied, the chief shall make and enter an order to that effect, which order shall specify the reasons for such denial, and shall cause a copy of such order to be served on the applicant by registered or certified mail. The chief shall also cause a notice to be served with the copy of such order, which notice shall advise the applicant of his right to appeal to the board by filing a notice of appeal, on the form prescribed by the board for such purpose, with the board, in accordance with the provisions of section fifteen (§ 20-5A-15) of this article, within thirty days after the date upon which the applicant received the copy of such order. However, an applicant may alter the plans and specifications for the proposed activity and submit a new application for any such permit, in which event the procedure hereinbefore outlined with respect to an original application shall apply.

(g) Upon the sale of property which includes an activity for which the department's permit was granted, the permit shall be transferable to the new owner, but the transfer shall not become effective until the provisions of section eight-b (§ 20-5A-8b) of this article are fully complied with, and until such transfer is made in the records of the division of water resources.

### 20-5A-8. Inspections; orders to compel compliance with permits; service of orders; prior permits.

After issuance of the department's permit for any activity, the chief or his duly authorized representatives may make field inspections of the work on the activity, and, after completion thereof, may inspect the completed activity, and, from time to time, may inspect the maintenance and operation of the activity.

To compel compliance with the terms and conditions of the department's permit for any activity, the chief is hereby authorized, after at least twenty days' notice, to make and enter an order revoking or suspending such permit.

The chief shall cause a copy of any such order to be served by registered or certified mail or by a conservation officer or other law-enforcement officer upon the person to whom any such permit was issued. The chief shall also cause a notice to be served with the copy of such order, which notice shall advise such person of his right to appeal to the board by filing a notice of appeal on the form prescribed by the board for such purpose, with the board, in accordance with the provisions of section fifteen (§ 20-5A-15) of this article, within thirty days after the date upon which such person received the copy of such order.

All permits for the discharge of sewage, industrial wastes or other wastes into any waters of the State issued by the water resources board prior to July one, one thousand nine hundred sixty-four and which have not been revoked prior to the effective date of this article shall be enforced under the terms and provisions of this article, and shall remain valid unless and until revoked or suspended in accordance with the terms and provisions of this article or in accordance with the terms and provisions of any rules or regulations promulgated thereunder.

### 20-5A-8a. Voluntary water quality monitors; appointment; duties; compensation.

The chief is hereby authorized to appoint voluntary water quality monitors to serve at the will and pleasure of the chief. All such monitors appointed pursuant hereto shall be twenty-one years of age or over and shall be bona fide residents of this State.

Such monitors are authorized to take water samples of the waters of this State at such times and at such places as the chief shall direct and to forward such water samples to the chief for analysis.

The chief is authorized to provide such monitors with such sampling materials and equipment as he deems necessary: Provided, that such equipment and materials shall at all times remain the property of the State and shall be immediately returned to the chief upon his direction.

Such monitors shall not be construed to be employees of this State for any purpose except that the chief is hereby authorized to pay such monitors a fee not to exceed fifty cents for each sample properly taken and forwarded to him as hereinabove provided.

The chief shall conduct schools to instruct said monitors in the methods and techniques of water sample taking and issue to said monitors an identification card or certificate showing their appointment and training.

Upon a showing that any water sample as herein provided was taken in conformity with standard and recognized procedures, such sample shall be admissible in any court of this State for the purpose of enforcing the provisions of this article.

### § 20-5A-8b. Responsible agent; duties; notification of change.

It shall be the duty of every operator of a well, from and after the effective date of this article (July 1, 1969), in cases wherein such well operator is the holder of a permit issued pursuant to the provisions of this article to designate an individual who is a resident of this State as a responsible agent for such well. The responsible agent shall be the attorney in fact for and in behalf of the operator, and upon whom notices, orders or other communications issued pursuant to this article may be served, and upon whom process may be served. In cases wherein there is a responsible agent designated under the provisions of section one-k (§ 22-4-1k), article four, chapter twenty-two of this Code, such responsible agent shall be deemed to be the responsible agent required by this section, and shall be so appointed by the operator. Every well operator so appointing an agent, shall within five days after the termination of such appointment, notify the department of such termination, and designate a new responsible agent.

### § 20-5A-9. Information to be filed by certain persons with division of water resources; tests.

Any and all persons directly or indirectly discharging or depositing treated or untreated sewage, industrial wastes, or other wastes, or the effluent therefrom, into or near any waters of the State shall file with the division of water resources such information as the chief thereof may reasonably require on forms prescribed by him for such purpose, including but not limited to, data as to the kind, characteristics, amount and rate of flow of such discharge or deposit. If the chief has reasonable cause to believe that any establishment is, or may be, polluting the waters of the State, he may require any person owning, operating or maintaining such establishment to furnish such information as may reasonably be required to ascertain whether such establishment is, or may be causing such pollution, and he may conduct any test or tests that he may deem necessary or useful in making his investigation and determination.

### 20-5A-10. Orders of chief to stop or prevent discharges or deposits or take remedial action; service of orders.

If the chief, on the basis of investigations, inspections and inquiries, determines that any person who does not have a valid permit issued pursuant to the provisions of this article is causing the pollution of any of the waters of the State, or does on occasions cause pollution or is violating any rule or regulation of the board, he shall, with the consent of the director, either make and enter an order directing such person to stop such pollution or the violation of the rule or regulation of the board, or make and enter an order directing such person to take corrective or remedial action. Such order shall also direct such person to apply forthwith for a permit in accordance with the provisions of sections five, six and seven (§§ 20-5A-5, 20-5A-6 and 20-5A-7) of this article. The chief shall fix a time limit for the completion of such action. Whether the chief shall make and enter an order to stop such pollution or shall make and enter an order to take remedial action, in either case the person so ordered may elect to cease operations of the establishment deemed to be the source of such discharge or deposits causing pollution, if the pollution referred to in the chief's order shall be stopped thereby.

In the sole discretion of the chief, he may postpone issuing any such order if he feels such pollution can be best controlled or reduced by cooperative efforts with the person or persons responsible therefor.

The chief shall cause a copy of any such order to be served by registered or certified mail or by a conservation officer or other law-enforcement officer upon such person. The chief shall also cause a notice to be served with the copy of such order, which notice shall advise such person of his right to appeal to the board by filing a notice of appeal, on the form prescribed by the board for such purpose, with the board, in accordance with the provisions of section fifteen (§ 20-5A-15) of this article.

### § 20-5A-11. Compliance with orders of chief.

Any person upon whom any order of the chief or any order of the board in accordance with the provisions of sections ten (§ 20-5A-10) and fifteen (§ 20-5A-15) of this article, has been served shall fully comply therewith.

When such person is ordered to take remedial action and does not elect to cease operation of the establishment deemed to be the source of such pollution, or when such ceasing does not stop the pollution, he shall forthwith apply for a permit under and in accordance with the provisions of sections five, six and seven (§§ 20-5A-5, 20-5A-6 and 20-5A-7) of this article. No such remedial action shall be taken until a permit therefor has been issued; however, receipt of a permit shall not in and of itself constitute remedial action.

### § 20-5A-11a. Power of eminent domain; procedures; legislative finding.

(a) When any person who is owner of an establishment is ordered by the chief to stop or prevent pollution or the violation of the rules and regulations of the board or to take corrective or remedial action, compliance with which order will require the acquisition, construction or installation of a new treatment works or the extension or modification of or an addition to an existing treatment works, (which acquisition, construction, installation, extension, modification or addition of or to a treatment works pursuant to such order is referred to in this section as "such compliance") such person may exercise the power of eminent domain in the manner provided in chapter fifty-four (§ 54-1-1 et seq.) of this Code, to acquire such real property or interests in real property as may be determined by the chief to be reasonably necessary for such compliance.

(b) Upon application by such person and after twenty days' written notice to all persons whose property may be affected, the chief shall make and enter an order determining the specific real property or interests in real property, if any, which are reasonably necessary for such compliance. In any proceeding under this section, the person seeking to exercise the right of eminent domain herein conferred shall establish the need for the amount of land sought to be condemned and that such land is reasonably necessary for the most practical method for such compliance.

(c) The right of eminent domain herein conferred shall not apply to the taking of any dwelling house or for the taking of any land within five hundred feet of any such dwelling house.

(d) The legislature hereby declares and finds that the taking and use of real property and interests in real property determined to be reasonably necessary for such compliance promotes the health, safety and general welfare of the citizens of this State by reducing and abating pollution in the waters of this State in which the public at large has an interest and otherwise; that such taking and use are necessary to provide and protect a safe, pure and adequate water supply to the municipalities and citizens of the State; that because of topography, patterns of land development and ownership and other factors it is impossibe in many cases to effect such compliance without the exercise of the power of eminent domain and that the use of real property or interests in real property to effect such compliance is a public use for which private property may be taken or destroyed.

### 20-5A-12. Duty to proceed with remedial action promptly upon receipt of permit; progress reports required; finances and funds.

When such person is ordered to take remedial action and does not elect to cease operation of the establishment deemed to be the source of such pollution or when ceasing does not stop the pollution, such person shall immediately take or begin appropriate steps or proceedings to carry out such remedial action. In any such case it shall be the duty of each individual offender, each member of a partnership, each member of the governing body of a municipal corporation and each member of the board of directors or other governing body of a private corporation, association or other legal entity whatever, to see that appropriate steps or proceedings to comply with such order are taken or begun immediately. The chief may require progress reports, at such time intervals as he deems necessary, setting forth the steps taken, the proceedings started and the progress made toward completion of such remedial action. All such remedial action shall be diligently prosecuted to completion.

Failure of the governing body of a municipal corporation, or the board of directors or other governing body of any private corporation, association or other legal entity whatever, to provide immediately for the financing and carrying out of such remedial action, as may be necessary to comply with said order, shall constitute failure to take or begin appropriate steps or proceedings to comply with such order. If such person be a municipal corporation, the cost of all such remedial action as may be necessary to comply with said order shall be paid out of funds on hand available for such purpose, or out of the general funds of such municipal corporation, not otherwise appropriated, and if there be not sufficient funds on hand or unappropriated, then the necessary funds shall be raised by the issuance of bonds, any direct general obligation bond issue to be subject to the approval of the state sinking fund commission and the attorney general of the State of West Virginia.

If the estimated cost of the remedial action to be taken by a municipal corporation to comply with such order is such that any bond issue necessary to finance such action would not raise the total outstanding bonded indebtedness of such municipal corporation in excess of the constitutional limit imposed upon such indebtedness by the Constitution of this State, then and in that event the necessary bonds may be issued as a direct obligation of such municipal corporation, and retired by a general tax levy to be levied against all property within the limit of such municipal corporation listed and assessed for taxation. If the amount of such bonds necessary to be issued would raise the total outstanding bonded indebtedness of such municipal corporation above said constitutional limitation on such indebtedness, or if such municipal corporation by its governing body shall decide against the issuance of direct obligation bonds, then such municipal corporation shall issue revenue bonds and provide for the retirement thereof in the same manner and subject to the same conditions as provided for the issuance and retirement of bonds in chapter twenty-five, acts of the legislature, first extraordinary session, one thousand nine hundred thirty-three (§§ 16-13-1 to 16-13-24), and any amendment thereof: Provided, that the provisions of section six (§ 16-13-6) of the above mentioned act, allowing objections to be filed with the governing body, and providing that a written protest of thirty percent or more of the owners of real estate shall require a four-fifths vote of the governing body for the issuance of said revenue bonds, shall not apply to bond issues proposed by any municipal corporation to comply with an order made and entered under the authority of this article, and such objections and submission of written protest shall not be authorized, nor shall the same, if made or had, operate to justify or excuse failure to comply with such order.

The funds made available by the issuance of either direct obligation bonds or revenue bonds, as herein provided, shall constitute a "sanitary fund," and shall be used for no other purpose than for carrying out such order; no public money so raised shall be expended by any municipal corporation for any purpose enumerated in this article, unless such expenditure and the amount thereof have been approved by the chief. The acquisition, construction or installation, use and operation, repair, modification, alteration, extension, equipment custody and maintenance of any disposal system by any municipal corporation, as herein provided, and the rights, powers and duties with respect thereto, of such municipal corporation and the respective officers and departments thereof, whether the same shall be financed by the issuance of revenue or direct obligation bonds, shall be governed by the provisions of said chapter twenty-five, acts of the legislature, first extraordinary session, one thousand nine hundred thirty-three, and any amendments thereof.

**20-5A-12a. Emergency orders.**

Whenever the chief finds that any discharge, release, escape, deposit or disposition of treated or untreated sewage, industrial wastes or other wastes into any waters within this State, when considered alone or in conjunction with other discharges, releases, escapes, deposits or dispositions, constitutes a clear, present and immediate danger to the health of the public, or to the fitness of a private or public water supply for drinking purposes, the chief may, with the concurrence in writing of the director of the department of natural resources and the director of the department of health, without notice or hearing, issue an order or orders requiring the immediate cessation or abatement of any such discharge, release, escape, deposit or disposition, and the cessation of any drilling, redrilling, deepening, casing, fracturing, pressuring, operating, plugging, abandoning, converting or combining of any well, or requiring such other action to be taken as the chief, with the concurrences aforesaid, deems necessary to abate such danger.

Notwithstanding the provisions of any other section of this article, any order issued under the provisions of this section shall be effective immediately and may be served in the same manner as a notice may be served under the provisions of section two (§ 29A-7-2), article seven, chapter twenty-nine-A of the Code. Any person to whom such order is directed shall comply therewith immediately, but on notice of appeal to the board shall be afforded a hearing as promptly as possible, and not later than ten days after the board receives such notice of appeal. On the basis of such hearing, and within five days thereafter, the board shall make and enter an order continuing the order of the chief in effect, revoking it, or modifying it. For the purpose of such appeal and judicial review of the order entered following an appeal hearing, all pertinent provisions of sections fifteen (§ 20-5A-15) and sixteen (§ 20-5A-16) of this article shall govern.

### § 20-5A-13. Time extensions.

The chief shall have the authority, in his sole discretion, to extend the time fixed in any order made and entered by him, or the board in accordance with the provisions of section fifteen (§ 20-5A-15) of this article, within which any person ordered to take remedial action who does not elect to cease the operation of the establishment deemed to be the source of said pollution, must complete such action, upon written petition filed with him prior to the time fixed in such order, when it shall appear that a good faith effort to comply with said order is being made, and that it shall be impossible for such person to complete remedial action within the time so fixed. When it shall appear from such petition that due to wartime or other governmental restrictions with respect to labor or material, or both, such compliance with any such order would be impossible or would place an undue burden upon such person, the chief shall stay execution of any such order until such time as it may satisfactorily appear that such wartime or other restrictions no longer exist. The chief may grant as many such extensions as he finds to be warranted by the facts and circumstances involved in any particular case.

### § 20-5A-14. Control by State as to pollution; continuing jurisdiction.

No right to violate the rules and regulations of the board or to continue existing pollution of any of the waters of the State shall exist nor shall such right be or be deemed to have been acquired by virtue of past or future pollution by any person. The right and control of the State in and over the quality of all waters of the State are hereby expressly reserved and reaffirmed. It is recognized that with the passage of time, additional efforts may have to be made by all persons toward control and reduction of the pollution of the waters of the State, irrespective of the fact that such persons may have previously complied with all orders of the chief or board. It is also recognized that there should be continuity and stability respecting pollution control measures taken in cooperation with, and with the approval of, the chief, or pursuant to orders of the chief or board. When a person is complying with the terms and conditions of a permit granted pursuant to the provisions of section seven (§ 20-5A-7) of this article or when a person has completed remedial action pursuant to an order of the chief or board, additional efforts may be required wherever and whenever the rules and regulations of the board are violated or the waters of the State are polluted by such person.

### 20-5A-15. Appeal to water resources board.

(a) Any person adversely affected by an order made and entered by the chief in accordance with the provisions of this article, or aggrieved by failure or refusal of the chief to act within the time required by section seven (§ 20-5A-7) of this article on an application for a permit or aggrieved by the terms and conditions of a permit granted under the provisions of this article, may appeal to the water resources board for an order vacating or modifying such order, or for such order, action or terms and conditions as the chief should have entered, taken or imposed. The person so appealing shall be known as the appellant and the chief shall be known as the appellee. If the chief denies a permit because of any disapproval of a permit application by one or more of the public officers required to review such application under the provisions of subsection (b), section seven (§ 20-5A-7) of this article, such public officers shall be joined as a coappellee or coappellees with the chief in such appeal.

(b) Such appeal shall be perfected by filing a notice of appeal, on the form prescribed by the board for such purposes, with the board within thirty days after date upon which the appellant received the copy of such order or received such permit, as the case may be. The filing of the notice of appeal shall not stay or suspend the execution of the order appealed from. If it appears to the director or the board that an unjust hardship to the appellant will result from the execution of the chief's order pending determination of the appeal, the director or the board may grant a suspension of such order and fix its terms. The notice of appeal shall set forth the order or terms and conditions complained of and the grounds upon which the appeal is based. A copy of the notice of appeal shall be filed by the board with the chief within three days after the notice of appeal is filed with the board.

(c) Within seven days after receipt of his copy of the notice of appeal, the chief shall prepare and certify to the board a complete record of the proceedings out of which the appeal arises including all documents and correspondence in the chief's file relating to the matter in question. With the consent of the board and upon such terms and conditions as the board may prescribe, any persons affected by any such activity or by such alleged pollution may by petition intervene as a party appellant or appellee. The board shall hear the appeal de novo, and evidence may be offered on behalf of the appellant and appellee, and, with the consent of the board, by any intervenors.

(d) All of the pertinent provisions of article five (§ 29A-5-1 et seq.), chapter twenty-nine-A of this Code shall apply to and govern the hearing on appeal authorized by this section and the administrative procedures in connection with and following such hearing, with like effect as if the provisions of said article five were set forth in extenso in this section, with the following modifications or exceptions:

(1) Unless the board directs otherwise, the appeal hearing shall be held in the city of Charleston, Kanawha county, West Virginia; and

(2) In accordance with the provisions of section one (§ 29-A-5-1), article five of said chapter twenty-nine-A, all of the testimony at any such hearing shall be recorded by stenographic notes and characters or by mechanical means. Such reported testimony shall be in every appeal hearing under this article be transcribed.

(e) Any such appeal hearing shall be conducted by a quorum of the board, but the parties may by stipulation agree to take evidence before a hearing examiner employed by the board. For the purpose of conducting such appeal hearing, any member of the board and the secretary thereof shall have the power and authority to issue subpoenas and subpoenas duces tecum in the name of the board, in accordance with the provisions of section one (§ 29A-5-1), article five, chapter twenty-nine-A of this Code. All subpoenas and subpoenas duces tecum shall be issued and served within the time and for the fees and shall be enforced, as specified in section one, article five of said chapter twenty-nine-A, and all of the said section one provisions dealing with subpoenas and subpoenas duces tecum shall apply to subpoenas and subpoenas duces tecum issued for the purpose of an appeal hearing hereunder.

(f) Any such hearing shall be held within twenty days after the date upon which the board received the timely notice of appeal, unless there is a postponement or continuance. The board may postpone or continue any hearing upon its own motion, or upon application of the appellant, the appellee or any intervenors for good cause shown. The chief shall be represented at any such hearing by the attorney general or his assistants. At any such hearing the appellant and any intervenor may represent himself or be represented by an attorney at law admitted to practice before any circuit court of this State.

(g) After such hearing and consideration of all of the testimony, evidence and record in the case, the board shall make and enter an order affirming, modifying or vacating the order of the chief, or shall make and enter such order as the chief should have entered, or shall make and enter an order approving or modifying the terms and conditions of any permit issued. In determining its course of action, the board shall take into consideration not only the factors which the chief was authorized to consider in making his order and in fixing the terms and conditions of any permit, but also the economic feasibility of treating and/or controlling the sewage, industrial wastes or other wastes involved.

(h) Such order shall be accompanied by findings of fact and conclusions of law as specified in section three (§ 29A-5-3), article five, chapter twenty-nine-A of this Code, and a copy of such order and accompanying findings and conclusions shall be served upon the appellant, and any intervenors, and their attorneys of record, if any, and upon the appellee in person or by registered or certified mail.

(i) The board shall also cause a notice to be served with the copy of such order, which notice shall advise the appellant, the appellee and any intervenors of their right to judicial review, in accordance with the provisions of section sixteen (§ 20-5A-16) of this article. The order of the board shall be final unless vacated or modified upon judicial review thereof in accordance with the provisions of section sixteen of this article.

**20-5A-16. Judicial review.**

(a) Any person or the chief adversely affected by an order made and entered by the board after such appeal hearing, held in accordance with the provisions of section fifteen (§ 20-5A-15) of this article, is entitled to judicial review thereof. All of the pertinent provisions of section four (§ 29A-5-4), article five, chapter twenty-nine-A of this Code shall apply to and govern such review with like effect as if the provisions of said section four were set forth in extenso in this section, with the following modifications or exceptions:

(1) As to cases involving an order denying an application for a permit, or approving or modifying the terms and conditions of a permit, the petition shall be filed, within the time specified in said section four, in the circuit court of Kanawha county;

(2) As to cases involving an order revoking or suspending a permit, the petition shall be filed, within the time specified in said section four, in the circuit court of Kanawha county: and

(3) As to cases involving an order directing that any and all discharges or deposits of sewage, industrial wastes, or other wastes, or the effluent therefrom, determined to be causing pollution be stopped or prevented or else that remedial action be taken, the petition shall be filed, within the time specified in said section four, in the circuit court of the county in which the establishment is located or in which the pollution occurs.

(b) The judgment of the circuit court shall be final unless reversed, vacated or modified on appeal to the supreme court of appeals, in accordance with the provisions of section one (§ 29A-6-1), article six, chapter twenty-nine-A of this Code, except that notwithstanding the provisions of said section one the petition seeking such review must be filed with said supreme court of appeals within ninety days from the date of entry of the judgment of the circuit court.

(c) Legal counsel and services for the chief in all appeal proceedings in the circuit court and in the supreme court of appeals of this State shall be provided by the attorney general or his assistants and in appeal proceedings in the circuit court by the prosecuting attorney of the county in which the appeal is taken, all without additional compensation.

**§20-5A-17. Injunctive relief.**

Upon application by the chief, the circuit courts of this State or the judges thereof in vacation may by injunction compel compliance with and enjoin violations of the provisions of this article, the rules and regulations of the board, the terms and conditions of any permit granted under the provisions of this article, or any order of the chief or board, and the venue of any such action shall be the county in which the violation or noncompliance exists or is taking place or in any county in which the waters thereof are polluted as the result of such violation or noncompliance. The court or the judge thereof in vacation may issue a preliminary injunction in any case pending a decision on the merits of any application filed. Any other section of this Code to the contrary notwithstanding, the State shall not be required to furnish bond as a prerequisite to obtaining injunctive relief under this article.

An application for an injunction under the provisions of this section may be filed and injunctive relief granted notwithstanding that all of the administrative remedies provided for in this article have not been pursued or invoked against the person or persons against whom such relief is sought and notwithstanding that the person or persons against whom such relief is sought have not been prosecuted or convicted under the provisions of this article.

The judgment of the circuit court upon any application filed under the provisions of this article shall be final unless reversed, vacated or modified on appeal to the supreme court of appeals. Any such appeal shall be sought in the manner provided by law for appeals from circuit courts in other civil cases, except that the petition seeking such review must be filed with said supreme court of appeals within ninety days from the date of entry of the judgment of the circuit court.

Legal counsel and services for the chief or the board in all injunction proceedings in the circuit courts and in the supreme court of appeals of this State shall be provided by the attorney general or his assistants and by the prosecuting attorneys of the several counties as well, all without additional compensation, or the chief or the board, with the written approval of the attorney general, may employ counsel to represent him or it in a particular proceeding.

**20-5A-18. Priority of actions.**

All applications under section seventeen (§ 20-5A-17) of this article and all proceedings for judicial review under section sixteen (§ 20-5A-16) of this article shall take priority on the docket of the circuit court in which pending, and shall take precedence over all other civil cases. Where such applications and proceedings for judicial review are pending in the same court at the same time, such applications shall take priority on the docket and shall take precedence over proceedings for judicial review.

**20-5A-19. Violations; criminal penalties.**

Any person who causes pollution or who fails or refuses to discharge any duty imposed upon him by this article or by any rule or regulation of the board, promulgated pursuant to the provisions and intent of this article, or by any order of the chief or board, or who fails or refuses to apply for and obtain a permit as required by the provisions of this article, or who fails or refuses to comply with any term or condition of such permit, shall be guilty of a misdemeanor, and, upon conviction thereof, shall be punished by a fine of not less than one hundred dollars nor more than one thousand dollars, or by imprisonment for a period not exceeding six months, or by both such fine and imprisonment. Any person who wilfully violates any provision of this article, or any rule or regulation of the board, or any order of the chief or board, or any term or condition of a permit, shall be guilty of a misdemeanor, and, upon conviction thereof, shall be punished by a fine of not less than one thousand nor more than ten thousand dollars or by imprisonment not exceeding six months or by both such fine and imprisonment. Each day upon which such failure continues shall constitute a separate offense.

Any person who fails or refuses to discharge any duty imposed upon him by this article, or by any rule or regulation of the board, or by an order of the chief or board, or who fails or refuses to apply for and obtain a permit as required by the provisions of this article, or by any rule or regulation of the board or who fails or refuses to comply with any term or condition of such permit, may be prosecuted and convicted under the provisions of this section notwithstanding that none of the administrative remedies provided for in this article have been pursued or invoked against said person and notwithstanding that an application for an injunction under the provisions of this article has not been filed against such person.

Where a person holding a permit is carrying out a program of pollution abatement or remedial action in compliance with the conditions and terms of such permit, he shall not be subject to criminal prosecution for pollution recognized and authorized by such permit.

### § 20-5A-19a. Civil liability; natural resources game-fish and aquatic life fund; use of funds.

If any loss of game-fish or aquatic life results from a person's or persons' failure or refusal to discharge any duty imposed upon him by this article, the West Virginia department of natural resources shall have a cause of action on behalf of the State of West Virginia to recover from such person or persons causing such loss a sum equal to the cost of replacing such game-fish or aquatic life.

Any moneys so collected by the director shall be deposited in a special revenue fund entitled "natural resources game-fish and aquatic life fund" and shall be expended as hereinafter provided. The fund shall be expended to stock waters of this State with game-fish and aquatic life. Where feasible, the director shall use any sum collected in accordance with the provisions of this section to stock waters in the area in which the loss resulting in the collection of such sum occurred. Any balance of such sum shall remain in said fund and be expended to stock state-owned and operated fishing lakes and ponds, wherever located in this State, with game-fish and aquatic life.

### 20-5A-20. Exceptions as to criminal liabilities.

The criminal liabilities imposed by section nineteen (§ 20-5A-19) of this article shall not be construed to include any violation resulting from accident or caused by an act of God, war, strike, riot or other catastrophe as to which negligence or wilful misconduct on the part of such person was not the proximate cause.

### 20-5A-21. Short title.

This article may be known and cited as the "Water Pollution Control Act."

### 20-5A-22. Existing rights and remedies preserved; article for benefit of State only.

It is the purpose of this article to provide additional and cumulative remedies to abate the pollution of the waters of the State and nothing herein contained shall abridge or alter rights of action or remedies now or hereafter existing, nor shall any provisions in this article, or any act done by virtue of this article, be construed as estopping the State, municipalties, public health officers, or persons as riparian owners or otherwise, in the exercise of their rights to suppress nuisances or to abate any pollution now or hereafter existing, or to recover damages.

The provisions of this article inure solely to and are for the benefit of the people generally of the State of West Virginia, and this article is not intended to in any way create new, or enlarge existing rights of riparian owners or others. An order of the chief or of the board, the effect of which is to find that pollution exists, or that any person is causing pollution, or any other order, or any violation of any of the provisions of this article shall give rise to no presumptions of law or findings of fact inuring to or for the benefit of persons other than the State of West Virginia.

**20-5A-23. Conflicting provisions; department of health.**

In the event of any inconsistency or conflict between any provision of this article and any provision of this chapter, the provisions of this article shall control. This article shall under no circumstances be construed as limiting or repealing the powers, authority or duties of the state department of health or the director thereof as provided in chapter sixteen (§ 16-1-1 et seq.) of this Code or otherwise by law.

**§ 20-5A-24. Severability of provisions.**

If any provision of this article or the application thereof to any person or circumstance is held invalid, such invalidity shall not affect other provisions or applications of the article which can be given effect without the invalid provision or its application, and to this end the provisions of this article are declared to be severable.

| COMPANY, LOCATION | RECEIVING STREAM | FLOW, G.P.D. | TREATMENT |
|---|---|---|---|
| **Eastern Assoc. Coal Corp.** | | | |
| 1 Grant Town | Paw Paw Creek | 28,800 | N, A, S |
| 2 Mayo Shaft | Robinson Run of Paw Paw Creek | | A, S |
| 3 Rachel | Buffalo Creek | 21,600 | A, S |
| **Bethlehem Coal Corp.** | | | |
| 4 Farmington | Dunkard Mill Run | 20,000 | A, S |
| 5 Barrackville | Impoundment All Water - Used In Coal Washer | | N, A |
| 6 Ida May | Impoundment All Water Used In Coal Washer | | N, A |
| **Christopher Coal Co.** | | | |
| 7 Mt. Morris Road | Dunkard Creek | 250,000 | N, A, S |
| 8 Fetty | Dunkard Creek | 250,000 | N, A, S |
| 9 Core | Pumped To Fetty For Treatment | 250,000 | |
| 10 Pedlar Run | Pedlar Run Creek | 100,000 | A, S |
| 11 Crown | Stewarts Run of Indian Creek | 250,000 | N, A, S |
| 12 Lynch Chapel | Little Indian Cr. | 250,000 | A, S |
| **Mountaineer Coal Co.** | | | |
| 13 Williams | Bingamon Creek | 300,000 | N, A, S |
| 14 Wyatt | Bingamon Creek | 300,000 | N, A, S |
| 15 Four States | Tevebaugh Creek | 75,000 | N, A, S |

| COMPANY, LOCATION | RECEIVING STREAM | FLOW, G.P.D. | TREATMENT |
|---|---|---|---|
| Clinchfield Coal Co. | | | |
| 16 Katy Lick | Katy Lick Creek | 125,000 | N, A, S |
| 17 Olive | Little Rock Camp Run | 200,000 | N, A, S |
| 18 Dola | Laurel Run of Ten Mile Creek | 125,000 | N, A, S |
| 19 Philippi | Tygart Valley River | 300,000 | N, A, S |

1)

N - Neutralization

A - Aeration

S - Settling (sludge)

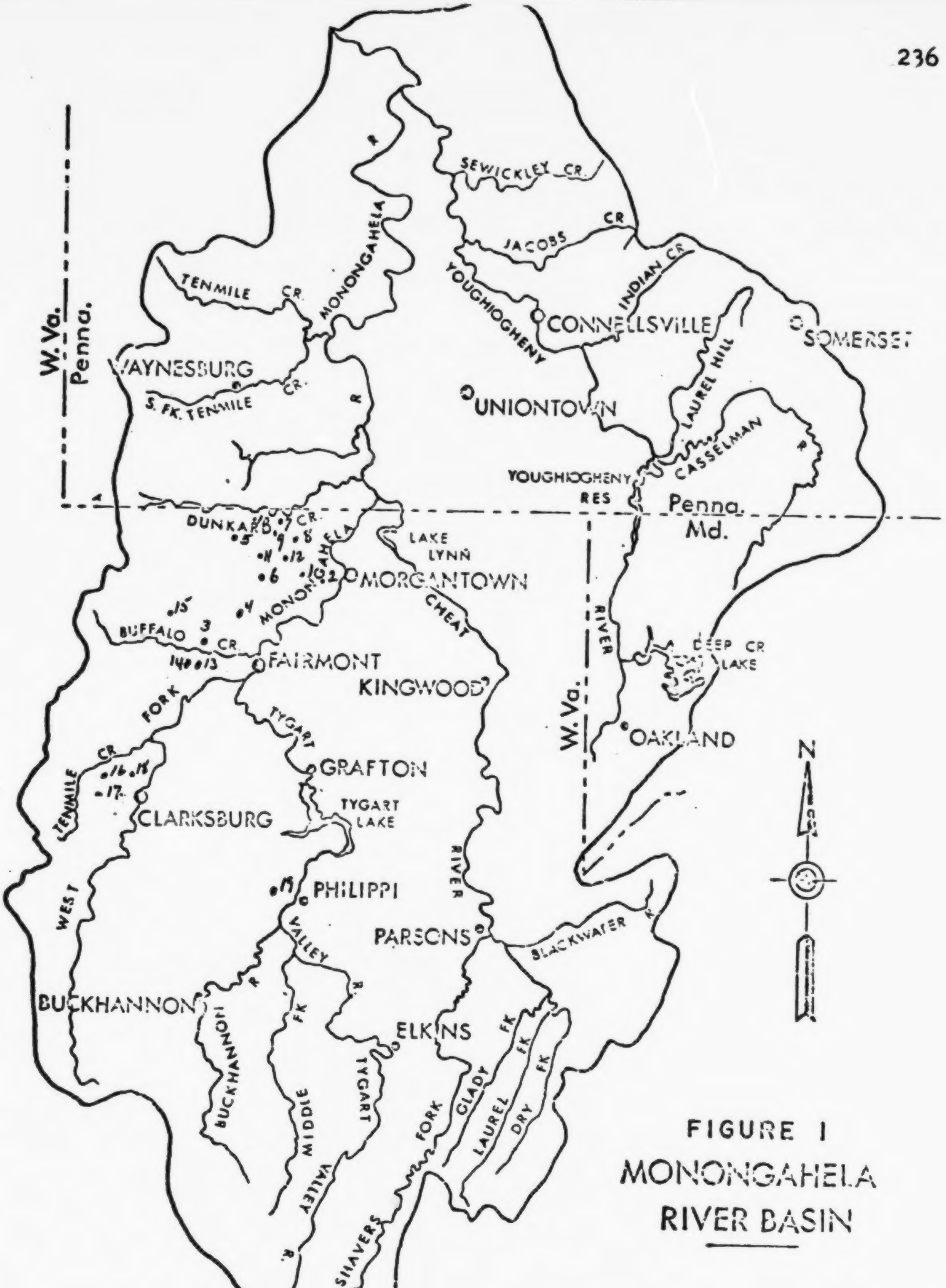

FIGURE I
MONONGAHELA
RIVER BASIN

# ADMINISTRATIVE REGULATIONS
of
THE STATE OF WEST VIRGINIA
for
WATER QUALITY CRITERIA
on
INTER AND INTRA STATE STREAMS

1970

DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WATER RESOURCES
CHARLESTON, WEST VIRGINIA
25305

ADMINISTRATIVE REGULATIONS
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1970

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25305

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# WEST VIRGINIA ADMINISTRATIVE REGULATIONS
# STATE WATER RESOURCES BOARD

## REQUIREMENTS GOVERNING THE DISCHARGE OF SEWAGE, INDUSTRIAL WASTES AND OTHER WASTES INTO THE WATERS OF THE STATE

Chapter 20, Articles 5 and 5A,
Code of West Virginia

John C. Ailes
Chairman
State Water Resources Board

Effective: August 18, 1970

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# WEST VIRGINIA ADMINISTRATIVE REGULATIONS
# STATE WATER RESOURCES BOARD

Chapter 20–5 and 20–5A
Series I
(1965)

Subject: REQUIREMENTS GOVERNING THE DISCHARGE OR DEPOSIT OF SEWAGE, INDUSTRIAL WASTES AND OTHER WASTES INTO THE WATERS OF THE STATE.

The State Water Resources Board and the Chief of the Division of Water Resources in the State Department of Natural Resources, under Chapter 20, Article 5A, Code of West Virginia, have the power and authority to determine whether any person, firm, municipality or corporation is polluting any of the waters of the State and to prevent, control, eliminate or reduce such pollution. In making such determination, due consideration shall be given, in accordance with the public policy of the State of West Virginia, to the use of available and reasonably practicable methods to control and reduce pollution. In so doing, recognition shall be given to the fact that each stream in the State may represent a separate problem and further, that the use of a watercourse for dilution of wastes is proper so long as the net results to not cause or contribute to conditions hereinafter not allowed.

## Section 1. GENERAL

1.01 Scope — These regulations establish requirements governing the discharge or deposit of sewage, industrial wastes and other wastes into the waters of the State.

1.02 Authority — These regulations are issued under authority of West Virginia Code, (Section 3, Article 5A, Chapter 20).

1.03 Effective Date — These regulations are promulgated on April 27, 1970, and become effective thirty days after filing in the Secretary of State's Office.

1.04 Filing Date — These regulations were filed in the Office of the Secretary of State of July 20, 1970.

1.05 Certification — These regulations are certified authentic by the Chairman of the State Water Resources Board by certification number 3.

## Section 2. DEFINITIONS

2.01 "Person", "waters", "pollution", "sewage", "industrial wastes", and "other wastes" shall have the same meanings as defined by the Code of West Virginia, Chapter 20, Article 5A, Section 2.

## Section 3. GENERAL CONDITIONS NOT ALLOWABLE IN STATE WATERS

3.01 Certain characteristics of sewage, industrial wastes or other wastes or factors which render waters directly or indirectly detrimental to the public health or unreasonably and adversely affect such waters for present or future reasonable uses, are objectionable in all waters of the State. Therefore, the State Water Resources Board does hereby proclaim that the following general conditions are not to be allowed in any of the waters of the State.

No sewage, industrial wastes or other wastes entering any of the waters of the State shall cause therein or materially to contribute to any of the following conditions thereof, which shall be the minimum conditions allowable:

(a) Distinctly visible floating or settleable solids, solids, scum, foam or oily sleeks of unreasonable kind or quantity;
(b) Objectionable deposits on bottom or sludge banks;
(c) Objectionable odors in the vicinity of the waters;
(d) Objectionable taste and/or odor in municipal water supplies;
(e) Concentrations of materials poisonous to man, animal or fish life;
(f) Dissolved oxygen concentration to be less than 3.0 parts per million at the point of maximum oxygen depletion;
(g) Objectionable color;
(h) Objectionable bacterial concentrations;
(i) Requiring an unreasonable degree of treatment for the production of potable water by modern water treatment processes as commonly employed.

3.02 Waters whose existing quality is better than the established standards will not be lowered in quality unless and until it has been affirmatively demonstrated to the Chief of the Division of Water Resources, Department of Natural Resources, that such change is justifiable as a result of necessary development and will not interfere with or become injurious to any present or future assigned uses of such waters. In special cases where the facts warrant, more stringent standards or exceptions thereto may be established. In implementing the policy of this paragraph as it relates to interstate streams, the Secretary of The Interior will be kept advised and provided with such information as he will need from time to time to protect the interests of the United States and the authority of the Secretary in maintaining high quality of interstate waters.

## Section 4. REPORTING SPILLS AND ACCIDENTAL DISCHARGES

4.01 It is recognized that spills and accidental discharges of sewage, industrial wastes and other wastes are contrary to the language and intent of the State Water Pollution Control Law and these spills and accidental discharges are likely to occur from time to time, notwithstanding efforts to prevent them.

It is further recognized that such spills and discharges are likely to have such a deleterious effect upon the quality of the waters of the State as to cause serious damage or to impose unwarranted burdens upon the downstream water users.

For these reasons the State has had a voluntary spill alert system in operation since 1958 and the State Water Resources Board hereby declares it mandatory that, in order to minimize the adverse effect which the above-described occurrences may have upon users of water of the State, the following procedures shall be followed:

(a) Each and every municipality, corporation, person or other entity which or who may cause or be responsible for any spill or accidental discharge into the waters of the State, of sewage, industrial waste or other substance of such character and in such quantity as to be unsightly or deleterious to the quality of such waters shall give prompt notification thereof by telephone to the Chief of the Division of Water Resources, State Department of Natural Resources, or an employee thereof;

(b) Such notification shall set forth the time and place of such spill or discharge, the type or types and quantity or quantities of the material or materials therein, action or actions taken to stop such spill or discharge and to minimize the polluting effect thereof, the measure or measures taken or to be taken in order to prevent a recurrence of any such spill or discharge and such additonal information as may be requested by the Division of Water Resources;

(c) It shall be the responsibility of each industrial establishment or other entity discharging directly to a stream to have available insofar as practicable and reasonable the following information pertaining to those substances that are employed or handled in its operation in sufficiently large amounts as to constitute a hazard in case of an accidental spill and discharge into a public stream:

(1) Potential toxicity in water to man,

animals and aquatic life;

(2) Details on analytical procedures for the quantitative estimation of such substances in water;

(3) Suggestions on safeguards or other precautionary measures to nullify the toxic effects of a substance once it has gotten into a stream;

(d) A written verification of such report shall be submitted upon request of the Division of Water Resources.

4.02 Parts 4.01 (a) and (b) shall also apply to spills to the waters of the State resulting from accidents to common carriers by highway, rail and water transporting chemicals or other substances which are likely to have a deleterious effect upon the receiving waters.

4.03 Failure to furnish such information as required by Section 9, Article 5A, Chapter 20, Code of West Virginia shall be punishable under Section 19, Article 5A, Chapter 20, Code of West Virginia.

## Section 5. ACID MINE DRAINAGE CONTROL MEASURES

5.01 Certain acid mine drainage control measures were adopted by the Ohio River Valley Water Sanitation Commission and promulgated as Resolution No. 5-60, as amended January 10, 1963. The State of West Virginia is a member of the Ohio River Valley Water Sanitation Compact and as such has agreed to carry out the control measures so established. Waters of the State of West Virginia are being polluted by acid discharges from coal mining and related operations, hereinafter referred to as "acid mine drainage", contrary to the language and intent of the State Water Pollution Control Law.

5.02 It has been demonstrated that the conscientious application of certain principles and practices will, under certain conditions, alleviate the pollution from acid mine drainage. Therefore, in furtherance of the policy and procedures of the State Water Resources Board, the following measures are hereby adopted by the Water Resources Board for the control of acid mine drainage pollution in the State of West Virginia:

(a) 1. Surface waters and ground waters shall be diverted where practicable to prevent the entry or reduce the flow of waters into and through workings.

2. Water that does gain entry to the workings shall be handled in a manner which will minimize the formation and discharge of acid mine drainage to streams.

(b) Refuse from the mining and processing of coal shall be handled and disposed of in a manner which will minimize discharge of acid mine drainage therefrom to streams. Where acid-producing materials are encountered in the overburden in stripping operations, these materials shall be handled so as to prevent or minimize the production of acid mine drainage, taking into consideration the need for stream pollution prevention and all economic factors involved.

(c) Discharge of acid mine drainage to streams shall be regulated insofar as practicable to equalize the flow of daily accumulations throughout a 24-hour period.

(d) Upon discontinuance of operations of any mine all practicable mine-closing measures, consistent with safety requirements shall be employed to minimize the formation and discharge of acid mine drainage.

(e) Under appropriate circumstances, consideration shall be given to the treatment of acid mine drainage by chemical or other means in order to mitigate its pollutional properties.

# WEST VIRGINIA ADMINISTRATIVE
# REGULATIONS
# STATE WATER RESOURCES BOARD

## REQUIREMENTS GOVERNING THE DISCHARGE OF SEWAGE, INDUSTRIAL WASTES AND OTHER WASTES INTO THE WATERS OF THE STATE AND ESTABLISHING GENERAL WATER USE CATEGORIES AND WATER QUALITY STANDARDS FOR THE WATERS OF THE STATE

Chapter 20, Articles 5 and 5A,
Code of West Virginia

John C. Ailes
Chairman
State Water Resources Board

# WEST VIRGINIA ADMINISTRATIVE
# REGULATIONS
# STATE WATER RESOURCES BOARD

**Chapter 20–5 & 20–5A**
**Series II**
**(1967)**

Subject: REQUIREMENTS GOVERNING THE DISCHARGE OR DEPOSIT OF SEWAGE, INDUSTRIAL WASTES AND OTHER WASTES INTO THE WATERS OF THE STATE.

The State Water Resources Board and the Chief of the Division of Water Resources in the State Department of Natural Resources, under Chapter 20, Article 5A, Code of West Virginia, have the power and authority to determine whether any person, firm, municipality or corporation is polluting the waters of the State and to prevent, control, eliminate or reduce such pollution. In making such determination, due consideration shall be given, in accordance with the public policy of the State of West Virginia, to the use of available and reasonably practicable methods to control and reduce pollution. In so doing, recognition shall be given to the fact that each stream in the State may present a separate problem and further that the use of a watercourse for dilution of wastes is proper so long as the net results do not cause or contribute to conditions hereinafter not allowed.

## Section 6. GENERAL AND WATER USE CATEGORIES

6.01 Scope. — These regulations establish requirements governing the discharge or deposit of sewage, industrial wastes and other wastes into the waters of the State and establish general water use categories and water quality standards for the waters of the State.

6.02 Authority. — These regulations are issued under authority of the West Virginia Code (Section 3, Article 5A, Chapter 20).

6.03 Effective Date. — These regulations are promulgated on April 27, 1970, and become effective thirty days after filing in the Secretary of State's Office.

6.04 Filing Date. — These regulations were filed in the Office of the Secretary of State on July 20, 1970.

6.05 Certification. — These regulations are certified authentic by the Chairman of the State Water Resources Board by certification number 3.

6.06 **Category A. Water Contact Recreation:** This category includes swimming, fishing, water skiing, and certain types of pleasure boating such as sailing in very small craft and small outboard motor boats.

6.07 **Category B1. Water Supply, Public:** This category is used to describe all waters used for public supplies. It does not include water for cooling.

6.08 **Category B2. Water Supply, Industrial:** This category is used to describe all waters used for industrial supplies. It does not include water for cooling.

6.09 **Category B3. Water Supply, Agricultural:** This category includes all water used for agriculture, includes irrigation, as well as livestock watering. It is understood that these waters would also be suitable for wildlife watering.

6.10 **Category C. Propagation of Fish and Other Aquatic Life:**
This category is self explanatory and does recognize the importance of other aquatic life in addition to fish.

6.11 **Category D. Water Transport, Cooling and Power:**
This category includes commercial and pleasure vessel activity, except those small craft included in Category A. Cooling water is that water used for industrial cooling. Power production in this definition is hydro power.

6.12 **Category E. Treated Wastes Transport and Assimilation:**
This category includes water of such quality as to assure safe passage of fish.

## Section 7. WATER USES AND WATER QUALITY CRITERIA

7.01 The following criteria are established for the purpose of maintaining water quality in all streams and their tributaries in West Virginia, draining to the North Branch of the Potomac River, including the South Branch of the Potomac River. The following stream quality standards are to apply at all times when flows are equal to or greater than the minimum mean 7-consecutive day drought flow with a 10-year return frequency.

(a) **Present Uses:** A, B1, B2, B3, C, D, E, (See Section 6).

(b) **Water Quality Criteria for Present Uses.**

1. **Dissolved Oxygen:** Not less than 5 mg/1 at any time.
2. **pH:** Not less than 6.0 nor more than 8.5, except streams carrying significant quantities of acid mine drainage shall have a pH of not less than 5.5.
3. **Temperature:** Not to exceed 87°F at any time during months of May through November and not to exceed 73°F at any time during months of December through April.
4. **Threshold Odor:** Threshold odor not to exceed a threshold odor number of 8 at 60 °C as a daily average.
5. **Toxic Substances:** Not to exceed 1/10 of the 96-hour median tolerance limit.
6. **Bacteria:** The Coliform group is not to exceed 1,000 per 100 ml as a monthly average value, nor exceed this number in 20 percent of the samples examined during any month, nor exceed 2,400 per 100 ml on any day.
7. **Radioactivity:** Gross beta activity not to exceed 1,000 picocuries per liter (pCi/1) nor shall activity from dissolved strontium-90 exceed 10 pCi/1, nor shall activity from dissolved alpha emitters exceed 3 pCi/1.
8. **Heavy Metals:** Not to exceed the following:

| Constituent | Concentration mg/1 |
|---|---|
| Arsenic | 0.01 |
| Barium | 0.50 |
| Cadmium | 0.01 |
| Chromium (Hexavalent) | 0.05 |
| Lead | 0.05 |
| Silver | 0.05 |

9. **Other Compounds:** Not to exceed the following:

| Constituent | Concentration mg/1 |
|---|---|
| Nitrates | 45 |
| Chlorides | 100 |
| Sulfates | 200 |
| Phenol | 0.001 |
| Cyanide | 0.025 |
| Fluoride | 1.0 |
| Selenium | 0.01 |

(c) **Future Uses:** A, B1, B2, B3, C, D, E.

(d) **Water Quality Criteria:** Same as Present Uses.

(e) In special cases where the facts warrant more stringent standards, or exceptions to the above standards, may be established in the individual case.

## Section 8. WATER USES AND WATER QUALITY CRITERIA

8.01 The following criteria are established for the purpose of maintaining water quality in all streams and their tributaries in West Virginia draining to the Potomac River from its headwaters at the junction of the north and south branches of the Potomac to the state line at Harpers Ferry, West Virginia, including the Shenandoah River. The following stream quality standards are to apply at all times when flows are equal to or greater than the minimum mean 7-consecutive-day drought flow with a 10-year return frequency.

(a) Present Uses: A, B1, B2, B3, C, D, E, (See Section 6).

(b) Water Quality Criteria for Present Users.

1. Dissolved Oxygen: Not less than 5 mg/l at any time.
2. pH: Not less than 6.0 nor more than 8.5, except streams carrying significant quanitites of acid mine drainage shall have a pH of not less than 5.5.
3. Temperature: Not to exceed 87°F at any time during the months of May through November and not to exceed 73°F at any time during December through April.
4. Threshold Odor: Threshold odor not to exceed a threshold odor number of 8 at 60°C as a daily average.
5. Toxic Substances: Not to exceed 1/10 of the 96-hour median tolerance limit.
6. Bacteria: The Coliform group is not to exceed 1,000 per 100 ml as a monthly average value, nor exceed this number in 20 percent of the samples examined during any month; nor exceed 2,400 per 100 ml on any day.
7. Radioactivity: Gross beta activity not to exceed 1,000 picocuries per liter (pCi/l) nor shall activity from dissolved strontium-90 exceed 10 pCi/l, nor shall activity from dissolved alpha emitters exceed 3 pCi/l.
8. Heavy Metals: Not to exceed the following:

| Constituents | Concentration mg/l |
|---|---|
| Arsenic | 0.01 |
| Barium | 0.50 |
| Cadmium | 0.01 |
| Chromium (Hexavalent) | 0.05 |
| Lead | 0.05 |
| Silver | 0.05 |

9. Other Compounds:

| Constituents | Concentration mg/l |
|---|---|
| Nitrates | 45 |
| Chlorides | 100 |
| Sulfates | 200 |
| Phenol | 0.001 |
| Cyanide | 0.025 |
| Fluoride | 1.0 |
| Selenium | 0.01 |

(c) Future Uses: A, B1, B2, B3, C, D, E, (See Section 6).

(d) Water Quality Criteria: Same as Present Uses.

(e) In special cases where the facts warrant more stringent standards, or exceptions to the above standards, may be established in the individual case.

## Section 9. WATER USES AND WATER QUALITY CRITERIA

9.01 Zone One: To include the Kanawha River and all of its tributaries from Mile Point 72 near Diamond, West Virginia to the junction of Gauley River and New River at Gauley Bridge. For purposes of maintaining water quality, the criteria proposed for Zone One will prevail also in all tributaries in Zone Two with the exception of Davis Creek and Simons Creek.

(a) Present Uses: A, B1, B3, C, D, (See Section 6).

(b) Water Quality Criteria for Present Uses: Based on a minimum flow of 2490 cfs at Kanawha Falls gauge, main stem Kanawha River only. On the tributaries of the Kanawha River, Zone One, to apply at all times when flows are equal to or greater than the minimum mean 7-consecutive-day drought flow with a 10-year return frequency.

1. Dissolved Oxygen: Not less than 5 mg/l at any time.
2. pH: Values normal for the waters in the area in question, however, generally held between 6 and 8.5, except streams carrying significant quantities of acid mine drainage shall have a pH of not less than 5.5.
3. Temperature: Not to exceed 87°F at any time during the months of May through November and not to exceed 73°F at any time during December through April.
4. Threshold Odor: Threshold odor not to exceed a threshold odor number of 8 at 60 °C as a daily average.
5. Toxic Substances: Not to exceed 1/10 of the 96-hour median tolerance limit.
6. Bacteria: The Coliform group is not to exceed 1,000 per 100 ml as a monthly average value, nor exceed this number in 20 percent of the samples examined during any month, nor exceed 2,400 per 100 ml on any day.
7. Radioactivity: Gross beta activity not to exceed 1,000 picocuries per liter (pCi/l) nor shall activity from dissolved strontium-90 exceed 10 pCi/l, nor shall activity from dissolved alpha emitters exceed 3 pCi/l.
8. Heavy Metals: Not to exceed the following:

| Constituents | Concentration mg/1 |
|---|---|
| Arsenic | 0.01 |
| Barium | 0.50 |
| Cadmium | 0.01 |
| Chromium (Hexavalent) | 0.05 |
| Lead | 0.05 |
| Silver | 0.05 |

9. Other Compounds:

| Constituents | Concentration mg/1 |
|---|---|
| Nitrates | 45 |
| Chlorides | 100 |
| Sulfates | 200 |
| Phenol | 0.001 |
| Cyanide | 0.025 |
| Fluoride | 1.0 |
| Selenium | 0.01 |

(c) Future Uses: A, B1, B3, C, D.

(d) Water Quality Criteria: Same as Present Uses.

(e) In special cases where the facts warrant, more stringent standards, or exceptions to the above standards, may be established in the individual case.

9.02 Zone Two: To include the Kanawha River and all tributaries not included in Zone One from Mile Point 0 to Mile Point 72.

(a) Present Uses: B1, B2, D, E.

(b) Water Quality Criteria for Present Uses: Based on a minimum flow of 2,890 cfs, at Charleston gauge.

1. Dissolved Oxygen: Not less than 3 mg/1 at any time.
2. pH: Values normal for the waters in the area in question, however, generally held between 6.0 and 8.5, except streams carrying significant quantities of acid mine drainage shall have a pH of not less than 5.5.
3. Temperature: Not to exceed 93°F in any case or 10°F above ambient stream temperature, whichever is limiting.
4. Threshold Odor: Threshold odor not to exceed a threshold odor number of 64 at 60°C as a daily average.
5. Toxic Substances: Not to exceed 1/10 of the 48-hour median tolerance limit.
6. Bacteria: The Coliform group is not to exceed 5,000 per 100 m1 as a monthly average nor exceed this number in more than 20 percent of the samples examined during the month, nor exceed 20,000 per 100 m1 in more than 5 percent of the samples.
7. Radioactivity: Gross beta activity not to exceed 1,000 picocuries per liter (pCi/1) nor shall activity from dissolved strontium-90 exceed 10 pCi/1 nor shall activity from dissolved alphs emitters exceed 3 pCi/1.
8. Heavy Metals: Not to exceed the following, regardless of flow:

| Constituents | Concentration mg/1 |
|---|---|
| Arsenic | 0.01 |
| Barium | 0.50 |
| Cadmium | 0.01 |
| Chromium (Hexavalent) | 0.05 |
| Lead | 0.05 |
| Silver | 0.05 |

9. Other Compounds:

| Constituents | Concentration mg/1 |
|---|---|
| Nitrates | 45 |
| Chloride | 200 |
| Sulfate | 200 |
| Phenol | 0.001 |
| Cyanide | 0.025 |
| Fluoride | 1.0 |
| Selenium | 0.01 |

(c) Future Uses: A, B1, B2, C (limited), D, E.

(d) Water Quality Criteria for Future Uses:

1. Dissolved Oxygen: Not less than 4 mg/1 at any time.
2. pH: Values normal for the waters in the area in question, however, generally held between 6.0 and 8.5, except streams carrying significant quantities of acid mine drainage shall have a pH of not less than 5.5.
3. Temperature: Not to exceed 93°F in any case or 10°F above ambient stream temperature, whichever is limiting.
4. Threshold Odor: Threshold odor not to exceed a threshold odor number of 24 at 60°C as a daily average.
5. Toxic Substances: Not to exceed 1/10 of the 96-hour median tolerance limit.
6. Bacteria: The Coliform group is not to exceed 1000 per 100 m1 as a monthly average value, nor exceed this number in more than 20 percent of the samples, nor exceed 2,400 per 100 m1 on any day.
7. Radioactivity: Gross beta activity not to exceed 1,000 picocuries per liter (pCi/1) nor shall activity from dissolved strontium-90 exceed 10 pCi/1, nor shall activity from alpha emitters exceed 3 pCi/1.
8. Heavy Metals: Not to exceed the following:

| Constituents | Concentration mg/1 |
|---|---|
| Arsenic | 0.01 |

| | |
|---|---|
| Barium | 0.50 |
| Cadmium | 0.01 |
| Chromium (Hexavalent) | 0.05 |
| Lead | 0.05 |
| Silver | 0.05 |

9. Other Compounds:

| Constituents | Concentration mg/1 |
|---|---|
| Nitrates | 45 |
| Chlorides | 100 |
| Sulfates | 200 |
| Phenol | 0.001 |
| Cyanide | 0.025 |
| Fluoride | 1.0 |
| Selenium | 0.01 |

(e) In special cases where the facts warrant, more stringent standards, or exceptions to the above standards, may be established in the individual case.

## Section 10. WATER USES AND WATER QUALITY CRITERIA

10.1 The following criteria are established for all the tributaries to the Bluestone River rising in West Virginia and flowing into Virginia for the purpose of maintaining water quality. The following stream standards are to apply at all times when flows are equal to or greater than the minimum mean 7-consecutive-day flow with a 10-year return frequency.

(a) Present Uses: B2, E (See Section 6).

(b) Water Quality Criteria for Present Uses:

1. Dissolved Oxygen: Not less than 3 mg/1 at any time.
2. pH: Values normal for the waters in the area in question, however, generally held between 6 and 8.5, except streams carrying significant quantities of acid mine drainage shall have a pH of not less than 5.5.
3. Temperature: Not to exceed 81°F at any time during the months of May through November and not exceed 73°F at any time during December through April.
4. Threshold Odor: Threshold odor not to exceed a threshold odor number of 8 at 60°C as a daily average.
5. Toxic Substances: Not to exceed 1/10 of the 96-hour median tolerance limit.
6. Bacteria: The Coliform group is not to exceed 5,000 per 100 ml as a monthly average nor exceed this number in more than 20 percent of the samples examined during the month, nor exceed 20,000 per 100 ml in more than 5 percent of the samples.

7. Radioactivity: Gross beta activity not to exceed 1,000 picocuries per liter (pCi/1) nor shall activity from dissolved strontium-90 exceed 10 pCi/1, nor shall activity from dissolved alpha emitters exceed 3 pCi /1.
8. Heavy Metals: Not to exceed the following:

| Constituents | Concentration mg/1 |
|---|---|
| Arsenic | 0.01 |
| Barium | 0.50 |
| Cadmium | 0.01 |
| Chromium (Hexavalent) | 0.05 |
| Lead | 0.05 |
| Silver | 0.05 |

9. Other Compounds:

| Constituents | Concentration mg/1 |
|---|---|
| Nitrates | 45 |
| Chlorides | 100 |
| Sulfates | 200 |
| Cyanide | 0.025 |
| Fluoride | 1.0 |
| Phenol | 0.001 |
| Selenium | 0.01 |

(c) Future Uses: A, B1, B2, C, E, (See Section 6).

(d) Water Quality Criteria for Future Uses:

1. Dissolved Oxygen: Not less than 4 mg/1 at any time.
2. pH: Values normal for the waters in the area in question, however, generally held between 6.0 and 8.5, except streams carrying significant quantities of acid mine drainage shall have a pH of not less than 5.5.
3. Temperature: Not to exceed 81°F at any time during the months of May through November and not to exceed 73°F at any time during December through April.
4. Threshold Odor: Threshold odor not to exceed a threshold odor number of 8 at 60°C as a daily average.
5. Toxic Substances: Not to exceed 1/10 of the 96-hour median tolerance limit.
6. Bacteria: The Coliform group is not to exceed 1000/100 ml as a monthly average value, nor exceed this number in more than 20 percent of the samples, nor exceed 2,400 per 100 ml on any day.
7. Radioactivity: Gross beta activity not to exceed 1,000 picocuries per liter (pCi/1) nor shall activity from dissolved strontium-90 exceed 10 pCi/1, nor shall activity from dissolved alpha emitters exceed 3 pCi/1.

8. Heavy Metals: Not to exceed the following:

| Constituents | Concentration mg/1 |
|---|---|
| Arsenic | 0.01 |
| Barium | 0.50 |
| Cadmium | 0.01 |
| Chromium (Hexavalent) | 0.05 |
| Lead | 0.05 |
| Silver | 0.05 |

9. Other Compounds:

| Constituents | Concentration mg/1 |
|---|---|
| Nitrates | 45 |
| Chlorides | 100 |
| Sulfates | 200 |
| Phenol | 0.001 |
| Cyanide | 0.025 |
| Fluroide | 1.0 |
| Selenium | 0.01 |

(e) In special cases where the facts warrant, more stringent standrads, or exceptions to the above standards, may be established in the individual case.

10.2 The following criteria are established for the Bluestone River and all its tributaries from the Virginia-West Virginia State line to the head of the backwater of the Bluestone Reservoir for the purpose of maintaining water quality. The following stream quality standards are to apply at all imes when flows are equal to or greater than the minimum mean 7-consecutive-day drought flow with a 10-year return frequency.

(a) Present Uses: A, B2, B3, C, E (See Section 6).

(b) Water Quality Criteria for Present Uses:

1. Dissolved Oxygen: Not less than 4 mg/1 at any time.
2. pH; Values normal for the waters in area in question, however, generally held between 6 and 8.5, except streams carrying significant quantities of acid mine drainage shall have a pH of not less than 5.5.
3. Temperature: Not to exceed 81°F at any time during the months of May through November and not to exceed 73°F at any time during November through April.
4. Threshold Odor: Threshold odor not to exceed a threshold odor number of 8 at 60°C as a daily average.
5. Toxic Substances: Not to exceed 1/10 of the 96-hour median tolerance limit.
6. Bacteria: The Coliform group is not to exceed 1,000 per 100 ml as a monthly average value, nor exceed this number in 20 percent of the samples examined during any month, nor exceed 2,400 per 100 ml on any day.

7. Radioactivity: Gross beta activity not to exceed 1,000 picocuries per liter (pCi/1) nor shall activity from dissolved strontium-90 exceed 10 pCi/1 nor shall activity from dissolved alpha emiiters exceed 3 pCi/1.
8. Heavy Metals: Not to exceed the following:

| Constituents | Concentration mg/1 |
|---|---|
| Arsenic | 0.01 |
| Barium | 0.50 |
| Cadmium | 0.01 |
| Chromium (Hexavalent) | 0.05 |
| Lead | 0.05 |
| Silver | 0.05 |

9. Other Compounds:

| Constituents | Concentration mg/1 |
|---|---|
| Nitrates | 45 |
| Chlorides | 100 |
| Sulfates | 200 |
| Phenol | 0.001 |
| Cyanide | 0.025 |
| Fluoride | 1.0 |
| Selenium | 0.01 |

(c) Future Uses: A, B1, B2, B3, C, D, E, (see Section 6).

(d) Water Quality Criteria: Same as Present Uses except dissolved oxygen.

1. Dissolved Oxygen: Not less than 5 mg/1 at any time.

(e) In special cases where the facts warrant, more stringent standards, or exceptions to the above standards, may be established in the individual case.

10.3 The following criteria are established for the East River and all its tributaries from its source to the West Virginia-Virginia State line for the purpose of maintaining water quality. The following stream standards are to apply at all times when flows are equal to or greater than the minimum mean 7-consecutive-day drought flow with a 10-year return frequency.

(a) Present Uses: A, B2, B3, C, E (See Section 6).

(b) Water Quality Criteria for Present Uses:

1. Dissolved Oxygen: Not less than 5 mg/1 at any time.
2. pH; Values normal for the waters in the area in question, however, generally held between 6.0 and 8.5, except streams carrying significant quantities of acid mine drainage shall have a pH of not less than 5.5.
3. Temperature: Not to exceed 81°F at any time during the months of May through November and not to exceed 73°F at any

time during December through April.

4. Threshold Odor: Threshold odor not to exceed a threshold odor number of 8 at 60°C as a daily average.

5. Toxic Substances: Not to exceed 1/10 of the 96-hour median tolerance limit.

6. Bacteria: The Coliform group is not to exceed 1,000 per 100 ml as a monthly average value, nor exceed this number in 20 percent of the samples examined during any month, nor exceed 2,400 per 100 ml on any day.

7. Radioactivity: Gross beta activity not to exceed 1,000 picocuries per liter (pCi/1) nor shall activity from dissolved strontium-90 exceed 10 pCi/1, nor shall activity from dissolved alpha emitters exceed 3 pCi/1.

8. Heavy Metals: Not to exceed the following:

| Constituents | Concentration mg/1 |
|---|---|
| Arsenic | 0.01 |
| Barium | 0.50 |
| Cadmium | 0.01 |
| Chromium (Hexavalent) | 0.05 |
| Lead | 0.05 |
| Silver | 0.05 |

9. Other Compounds:

| Constituents | Concentration mg/1 |
|---|---|
| Nitrates | 45 |
| Chlorides | 100 |
| Sulfates | 200 |
| Phenol | 0.001 |
| Cyanide | 0.025 |
| Fluoride | 1.0 |
| Selenium | 0.01 |

(c) Future Uses: A, B1, B2, B3, C, E, (See Section 6).

(d) Water Quality Criteria: Same as Present Uses.

(e) In special cases where the facts warrant, more stringent standards, or exceptions to the above standards, may be established in the individual case.

10.4 The following criteria are established for the New River and all its tributaries, except the Bluestone and East Rivers, from the West Virginia-Virginia State line to the head of the backwater of the Bluestone Reservoir for the purpose of maintaining water quality. The following stream quality standards are to apply at all times when flows are equal to or greater than the minimum mean 7-consecutive-day drought flow with a 10-year return frequency.

(a) Present Uses: A, B2, B3, C, E (See Section 6).

(b) Water Quality Criteria for Present Uses:

1. Dissolved Oxygen: Not less than 5 mg/1 at any time.

2. pH: Values normal for the waters in the area in question, however, generally held between 6.0 and 8.5, except streams carrying significant quantities of acid mine drainage shall have a pH of not less than 5.5.

3. Temperature: Not to exceed 81°F at any time during the months of May through November and not to exceed 73°F at any time during December through April.

4. Threshold Odor: Threshold odor not to exceed a threshold odor number of 8 at 60°C as a daily average.

5. Toxic Substances: Not to exceed 1/10 of the 96-hour median tolerance limit.

6. Bacteria: The Coliform group is not to exceed 1000/100 ml as a monthly average value, nor exceed this number in more than 20 percent of the samples, nor exceed 2,400 per 100 ml on any day.

7. Radioactivity: Gross beta activity not to exceed 1,000 picocuries per liter (pCi/1) nor shall activity from dissolved strontium-90 exceed 10 pCi/1, nor shall activity from dissolved alpha emitters exceed 3 pCi/1.

8. Heavy Metals: Not to exceed the following:

| Constituents | Concentration mg/1 |
|---|---|
| Arsenic | 0.01 |
| Barium | 0.50 |
| Cadmium | 0.01 |
| Chromium (Hexavalent) | 0.05 |
| Lead | 0.05 |
| Silver | 0.05 |

9. Other Compounds:

| Constituents | Concentration mg/1 |
|---|---|
| Nitrate | 45 |
| Chlorides | 100 |
| Sulfates | 200 |
| Phenol | 0.001 |
| Cyanide | 0.025 |
| Fluoride | 1.0 |
| Selenium | 0.01 |

(c) Future Uses: A, B1, B2, B3, C, E (See Section 6).

(d) Water Quality Criteria for Future Uses:

(e) In special cases where the facts warrant, more stringent standards, or exceptions to the above standards, may be established in the individual case.

10.5 The following criteria are established for the New River and all its tributaries from the tailwaters of the Bluestone Reservoir to the confluence with the

Gauley River, at which point the New River and the Gauley River from the Kanawha River. These criteria are established for the purpose of maintaining water quality. The following stream quality standards are to apply at all times when flows are equal to or greater than the minimum mean 7-consecutive-day drought flow with a 10-year return frequency.

**(a) Present Uses**: A, B1, B2, B3, C, D, E (See Section 6).

**(b) Water Quality Criteria for Present Uses:**

1. **Dissolved Oxygen**: Not less than 5 mg/1 at any time.
2. **pH**: Values normal for the waters in the area in question, however, generally held between 6.0 and 8.5, except streams carrying significant quantities of acid mine drainage shall have a pH of not less than 5.5.
3. **Temperature**: Not to exceed 81°F at any time during the months of May through November and not to exceed 73°F at any time during December through April.
4. **Threshold Odor**: Threshold odor not to exceed a threshold odor number of 8 at 60°C as a daily average.
5. **Toxic Substances**: Not to exceed 1/10 of the 96-hour median tolerance limit.
6. **Bacteria**: The Coliform group is not to exceed 1,000/100 ml as a monthly average value, nor exceed this number in more than 20 percent of the samples examined during any month, nor exceed 2,400 per 100 ml on any day.
7. **Radioactivity**: Gross beta activity not to exceed 1,000 picocuries per liter (pCi/1) nor shall activity from dissolved strontium-90 exceed 10 pC/1, nor shall activity from dissolved alpha emitters exceed 3 pCi/1.
8. **Heavy Metals**: Not to exceed the following:

| Constituents | Concentration mg/1 |
|---|---|
| Arsenic | 0.01 |
| Barium | 0.50 |
| Cadmium | 0.01 |
| Chromium (Hexavalent) | 0.05 |
| Lead | 0.05 |
| Silver | 0.05 |

9. **Other Compounds**:

| Constituents | Concentration mg/1 |
|---|---|
| Nitrates | 45 |
| Chlorides | 100 |
| Sulfate | 200 |
| Phenol | 0.001 |
| Cyanide | 0.025 |
| Fluoride | 1.0 |
| Selenium | 0.01 |

(c) Future Uses: A, B1, B2, B3, C, D, E (See Section 6).

**(d) Water Quality Criteria for Future Uses:**
Same as for Present Uses.

(e) In special cases where the facts warrant, more stringent standards, or exceptions to the above standards, may be established in the individual case.

10.6 The following water quality criteria are established for the Bluestone Reservoir for the purpose of maintaining water quality.

(a) Present Uses: A, B1, C, E (See Section 6).

**(b) Water Quality Criteria for Present Uses:**

1. Dissolved Oxygen: Not less than 5 mg/1 at any time.
2. pH: Values normal for the waters in the area in question, however, generally held between 6.0 and 8.5, except streams carrying significant quantities of acid mine drainage shall have a pH of not less than 5.5.
3. Temperature: Not to exceed 81°F at any time during the months of May through November and not to exceed 73°F at any time during December through April.
4. Threshold Odor: Threshold odor not to exceed a threshold odor number of 8 at 60°C as a daily average.
5. Toxic Substances: Not to exceed 1/10 of the 96-hour median tolerance limit.
6. Bacteria: The Coliform group is not to exceed 1,000 per 100 ml as a monthly average value, nor exceed this number in more than 20 percent of the samples examined during any month, nor exceed 2,400 per 100 ml on any day.
7. Radioactivity: Gross beta activity not to exceed 1,000 picocuries per liter (pCi/1) nor shall activity from dissolved strontium-90 exceed 10 pCi/1, nor shall activity from dissolved alpha emitters exceed 3 pCi/1.
8. Heavy Metals: Not to exceed the following:

| Constituents | Concentration mg/1 |
|---|---|
| Arsenic | 0.01 |
| Barium | 0.50 |
| Cadmium | 0.01 |
| Chromium (Hexavalent) | 0.05 |
| Lead | 0.05 |
| Silver | 0.05 |

9. Other Compounds:

| Constituents | Concentration mg/1 |
|---|---|
| Nitrates | 45 |
| Chlorides | 100 |
| Sulfate | 200 |
| Phenol | 0.001 |
| Cyanide | 0.025 |
| Fluoride | 1.0 |
| Selenium | 0.01 |

(c) Future Uses: A, B1, C, D, E (See Section 6).

(d) **Water Quality Criteria for Future Uses:** Same as for Present Uses.

(e) In special cases where the facts warrant, more stringent standards, or exceptions to the above standards, may be established in the individual case.

10.7 The following criteria are established for the purpose of maintaining water quality for the Gauley River and all its tributaries from its source to the confluence with the New River, which junction forms the Kanawha River. The following stream quality standards are to apply at all times when flows are equal to or greater than the minimum mean 7-consecutive-day drought flow with a 10-year return frequency. The Gauley River and its tributaries lie entirely within West Virginia.

(a) Present Uses: A, B1, B2, B3, C, E, (See Section 6).

(b) **Water Quality Criteria for Present Uses:**

1. Dissolved Oxygen: Not less than 5 mg/1 at any time.
2. pH: Values normal for the waters in the area in question, however, generally held between 6 and 8.5, except streams carrying significant quantities of acid mine drainage shall have a pH of not less than 5.5.
3. Temperature: Not to exceed 81°F at any time during the months of May through November and not to exceed 73°F at any time during December through April.
4. Threshold Odor: Threshold odor not to exceed a threshold odor number of 8 at 60°C as a daily average.
5. Toxic Substances: Not to exceed 1/10 of the 96-hour median tolerance limit.
6. Bacteria: The Coliform group is not to exceed 1,000 per 100 ml as a monthly average value, nor exceed this number in 20 percent of the samples examined during any month, nor exceed 2,400 per 100 ml on any day.
7. Radioactivity: Gross beta activity not to exceed 1,000 picocuries per liter (pCi/1) nor shall activity from dissolved strontium-90 exceed 10 pCi/1, nor shall activity from dissolved alpha emitters exceed 3 pCi/1.

8. Heavy Metals: Not to exceed the following:

| Constituents | Concentration mg/1 |
|---|---|
| Arsenic | 0.01 |
| Barium | 0.50 |
| Cadmium | 0.01 |
| Chromium (Hexavalent) | 0.05 |
| Lead | 0.05 |
| Silver | 0.05 |

9. Other Compounds:

| Constituents | Concentration mg/1 |
|---|---|
| Nitrates | 45 |
| Chlorides | 100 |
| Sulfates | 200 |
| Phenol | 0.001 |
| Cyanide | 0.025 |
| Fluoride | 1.0 |
| Selenium | 0.01 |

(c) Future Uses: A,B1, B2, B3, C, E (See Section 6).

(d) Water Quality Criteria: Same as Present Uses.

(e) In special cases where the facts warrant, more stringent standards, or exceptions to the above standards, may be established in the individual case.

Section 11. WATER USES AND WATER QUALITY CRITERIA.

11.01 The following criteria are established for the purpose of maintaining water quality in the Big Sandy River and all its tributaries arising in West Virginia from its mouth at Kenova, West Virginia, to the confluence of the Levisa Fork and Tug Fork. The following stream standards are to apply at all times when flows are equal to or greater than the minimum mean 7-consecutive-day drought flow with a 10-year return frequency.

(a) Present Uses: A, B1, B2, B3, C, D, E (See Section 6).

(b) **Water Quality Criteria for Present Uses:**

1. Dissolved Oxygen: Not less than 5 mg/1 at any time.
2. pH: Values normal for the waters in the area in question, however, generally held between 6 and 8.5, except streams carrying significant quantities of acid mine drainage shall have a pH of not less than 5.5.
3. Temperature: Not to exceed 87°F at any time during the months of May through November and not to exceed 73°F at any

time during the months of December through April.

4. Threshold Odor: Threshold odor not to exceed a threshold odor number of 8 at 60°C as a daily average.
5. Toxic Substances: Not to exceed 1/10 of the 96-hour median tolerance limit.
6. Bacteria: The Coliform group is not to exceed 1,000 per 100 ml as a monthly average value, nor exceed this number in 20 percent of the samples examined during any month, nor exceed 2,400 per 100 ml on any day.
7. Radioactivity: Gross beta activity not to exceed 1,000 picocuries per liter (pCi/1), nor shall activity from dissolved strontium-90 exceed 10 pCi/1, nor shall activity from dissolved alpha emitters exceed 3 pCi/1.
8. Heavy Metals: Not to exceed the following:

| **Constituents** | **Concentration mg/1** |
|---|---|
| Arsenic | 0.01 |
| Barium | 0.50 |
| Cadmium | 0.01 |
| Chromium (Hexavalent) | 0.05 |
| Lead | 0.05 |
| Silver | 0.05 |

9. Other Compounds:

| **Constituents** | **Concentration mg/1** |
|---|---|
| Nitrates | 45 |
| Chlorides | 100 |
| Sulfates | 200 |
| Phenol | 0.001 |
| Cyanide | 0.025 |
| Fluoride | 1.0 |
| Selenium | 0.01 |

(c) Future Uses: A, B1, B2, B3, C, D, E (See Section 6).

(d) Water Quality Criteria: Same as Present Uses.

(e) In special cases where the facts warrant, more stringent standards, or exceptions to the above standards, may be established in the individual case.

11.02 The following criteria are established for the purpose of maintaining water quality in the Tug Fork and all its tributaries arising in West Virginia, from its confluence with Levisa Fork to its headwaters and all tributary streams to the Tug Fork crossing the State boundary from Virginia into West Virginia. The following stream quality standards are to apply at all times when flows are equal to or greater than the minimum 7-consectuive-day drought flow with a 10-year return frequency.

(a) Present Uses: A, B1, B2, B3, C, D, E (See Section 6).

**(b) Water Quality Criteria for Present Uses:**

1. Dissolved Oxygen: Not less than 5 mg/1 at any time.
2. pH: Values normal for the waters in the area in question, however, generally held between 6.0 and 8.5, except streams carrying significant quantities of acid mine drainage shall have a pH of not less than 5.5.
3. Temperature: Not to exceed 87°F at any time during the months of May through November and not to exceed 73°F at any time during months of December through April.
4. Threshold Odor: Threshold odor not to exceed a threshold odor number of 8 at 60°C as a daily average.
5. Toxic Substances: Not to exceed 1/10 of the 96-hour median tolerance limit.
6. Bacteria: The Coliform group is not to exceed 1,000 per 100 ml as a monthly average value, nor exceed this number in 20 percent of the samples examined during any month, nor exceed 2,400 per 100 ml on any day.
7. Radioactivity: Gross beta activity not to exceed 1,000 picocuries per liter (pCi/1) nor shall activity from dissolved strontium-90 exceed 10 pCi/1, nor shall activity from dissolved alpha emitters exceed 3 pCi/1.
8. Heavy Metals: Not to exceed the following:

| **Constituents** | **Concentration mg/1** |
|---|---|
| Arsenic | 0.01 |
| Barium | 0.50 |
| Cadmium | 0.01 |
| Chromium (Hexavalent) | 0.05 |
| Lead | 0.05 |
| Silver | 0.05 |

9. Other Compounds:

| **Constituents** | **Concentration mg/1** |
|---|---|
| Nitrates | 45 |
| Chlorides | 100 |
| Sulfates | 200 |
| Phenol | 0.001 |
| Cyanide | 0.025 |
| Fluoride | 1.0 |
| Selenium | 0.01 |

(c) Future Uses: A, B1, B2, B3, C, D, E (See Section 6).

**(d) Water Quality Criteria: Same as Present Uses.**

(e) In special cases where the facts warrant, more stringent standards, or exceptions to the above standards, may be established in the individual case.

11.03 The following criteria are established for the purpose of maintaining water quality in the Guyandotte River and all its tributaries from its mouth at Hungtington, West Virginia, to its headwaters. (The Guyandotte River Basin is wholly located within West Virginia). The following stream quality standards are to apply at all times when flows are equal to or greater than the minimum mean 7-consecutive-day drought flow with a 10-year return frequency.

(a) Present Uses: A, B1, B2, B3, C, D, E (See Section 6).

(b) **Water Quality Criteria for Present Uses:**

1. Dissolved Oxygen: Not less than 5 mg/1 at any time.
2. pH: Values normal for the waters in the area in question, however, generally held between 6.0 and 8.5, except streams having significant quantities of acid mine drainage shall have a pH of not less than 5.5.
3. Temperature: Not to exceed 87°F at any time during the months of May through November and not to exceed 73°F at any time during the months of December through April.
4. Threshold Odor: Threshold odor not to exceed a threshold odor number of 8 at 60°C as a daily average.
5. Toxic Substances: Not to exceed 1/10 of the 96-hour median tolerance limit.
6. Bacteria: The Coliform group is not to exceed 1,000 per 100 ml as a monthly average value, nor exceed this number in 20 percent of the samples examined during any month, nor exceed 2,400 per 100 ml on any day.
7. Radioactivity: Gross beta activity not to exceed 1,000 picocuries per liter (pCi/1), nor shall activity from dissolved strontium-90 exceed 10 pCi/1, nor shall activity from dissolved alpha emitters exceed 3 pCi/1.
8. Heavy metals: Not to exceed the following:

| **Constituents** | **Concentration mg/1** |
|---|---|
| Arsenic | 0.01 |
| Barium | 0.50 |
| Cadmium | 0.01 |
| Chromium (Hexavalent) | 0.05 |
| Lead | 0.05 |
| Silver | 0.05 |

9. **Other Compounds:**

| **Constituents** | **Concentration mg/1** |
|---|---|
| Nitrates | 45 |
| Chlorides | 100 |
| Sulfates | 200 |
| Phenol | 0.001 |
| Cyanide | 0.025 |
| Fluoride | 1.0 |
| Selenium | 0.01 |

(c) Future Uses: A, B1, B2, B3, C, D, E (See Section 6).

(d) **Water Quality Criteria**: Same as Present Uses.

(e) In special cases where the facts warrant, more stringent standards, or exceptions to the above standards, may be established in the individual case.

## Section 12. WATER USES AND WATER QUALITY CRITERIA.

12.01 The following criteria are established for the purpose of maintaining water quality in the main stem of the Ohio River from the Ohio-Pennsylvania-West Virginia State line to the Ohio-Kentucky-West Virginia State line: The following stream quality standards are to apply at all times when flows are equal to or greater than the minimum mean 7-consecutive-day drought flow with a 10-year return frequncy.

(a) Present Uses: A, B1, B2, B3, C, D, E, (See Section 6).

(b) **Water Quality Criteria for Present Uses:**

1. Dissolved Oxygen: Not less than 5.0 mg/1 during at least 16 hours of any 24-hour period, nor less than 3.0 mg/1 at any time.
2. pH: No values below 5.5 nor above 9.0 and daily average (or median) values preferably between 6.5 and 8.5, except streams carrying significant quantities of acid mine drainage shall have a pH of not less than 5.5.
3. Temperature: Not to exceed 93°F at any time during the months of May through November, and not to exceed 73°F at any time during the months of December through April.
4. Threshold Odor: Threshold odor not to exceed a threshold odor number of 24 at 60°C as a daily average.
5. Toxic Substances: Not to exceed 1/10 of the 48-hour median tolerance limit, except that other limiting concentrations may be used in specific cases when jsutified on the basis of available evidence and approved by the appropriate agency.

6. Bacteria: The Coliform group is not to exceed 1,000 per 100 ml as a monthly average value; nor exceed this number in 20 percent of the samples examined during any month, nor exceed 2,400 per 100 ml on any day.
7. Radioactivity: Gross beta activity not to exceed 1,000 picocuries per liter (pCi/1), nor shall activity from dissolved strontium-90 exceed 10 pCi/1, nor shall activity from disolved alpha emitters exceed 3 pCi/1.
8. Heavy Metals: Not to exceed the following:

| Constituents | Concentration mg/1 |
|---|---|
| Arsenic | 0.01 |
| Barium | 0.50 |
| Cadmium | 0.01 |
| Chromium (Hexavalent) | 0.05 |
| Lead | 0.05 |
| Silver | 0.05 |

9. Other Compounds:

| Constiutents | Concentration mg/1 |
|---|---|
| Nitrates | 45 |
| Phenol | 0.001 |
| Cyanide | 0.001 |
| Fluoride | 1.0 |
| Selenium | 0.01 |

(c) Future Uses: A, B1, B2, B3, C, D, E (See Section 6).

(d) Water Quality Criteria for Future Uses:

1. Dissolved Oxygen: Not less than 5 mg/1 at any time.
2. pH: Values normal for the waters in the area in question, however, generally held between 6 and 8.5, except streams carrying significant quantities of acid mine drainage shall have a pH of not less than 5.5.
3. Temperature: Not to exceed 87 °F at any time during the months of May through November and not to exceed 73 °F at any time during months of December through April.
4. Threshold Odor: Threshold odor not to exceed a threshold odor number of 8 at 60 °C as a daily average.
5. Toxic Substances: Not to exceed 1/10 of the 96-hour median tolerance limit.
6. Bacteria: The Coliform group is not to exceed 1,000 per 100 ml as a monthly average value, nor exceed this number in 20 percent of the samples examined during any month, nor exceed 2,400 per 100 ml on any day.
7. Radioactivity: Gross beta activity not to exceed 1,000 picocuries per liter (pCi/1) nor shall activity from dissolved strontium-90 exceed 10 pCi/1, nor shall activity from dissolved alpha emitters exceed 3 pCi/1.
8. Heavy Metals: Not to exceed the following:

| Constituents | Concentration mg/1 |
|---|---|
| Arsenic | 0.01 |
| Barium | 0.50 |
| Cadmium | 0.01 |
| Chromium (Hexavalent) | 0.05 |
| Lead | 0.05 |
| Silver | 0.05 |

9. Other Compounds:

| Constituents | Concentration mg/1 |
|---|---|
| Nitrates | 45 |
| Phenol | 0.001 |
| Cyanide | 0.025 |
| Fluoride | 1.0 |
| Selenium | 0.01 |

(e) In special cases where the facts warrant, more stringent standards, or exceptions to the above standards, may be established in the individual case.

12.02 The following criteria are established for the purpose of maintaining water quality in all the tributaries of the Ohio River in West Virginia, excluding the Big Sandy, Guyandotte and Kanawha Rivers. The following stream standards are to apply at all times when the flows are equal to or greater than the minimum mean 7-consecutive-day drought flow with a 10-year return frequency.

(a) Present Uses: A, B1, B2, B3, C, D, E (See Section 6).

(b) Water Quality Criteria for Present Uses:

1. Dissolved Oxygen: Not less than 5 mg/1 at any time.
2. pH: Values normal for the waters in the area in question, however, generally held between 6.0 and 8.5, except streams carrying significant quantities of acid mine drainage shall have a pH of not less than 5.5.
3. Temperature: Not to exceed 87 °F at any time during the months of May through November and not to exceed 73 °F at any time during months of December through April.
4. Threshold Odor: Threshold odor not to exceed a threshold odor number of 8 at 60 °C as a daily average.
5. Toxic Substances: Not to exceed 1/10 of

the 96-hour median tolerance limit.

6. Bacteria: The Coliform group is not to exceed 1000/100 ml as a monthly average value, nor exceed this number in more than 20 percent of the samples examined during any month, nor exceed 2,400 per ml on any day.
7. Radioactivity: Gross beta activity not to exceed 1,000 picocuries per liter (pCi/1) nor shall activity from dissolved strontium-90 exceed 10 pCi/1, nor shall activity from dissolved alpha emitters exceed 3 pCi/1.
8. Heavy Metals: Not to exceed the following:

| Constituents | Concentration mg/1 |
|---|---|
| Arsenic | 0.01 |
| Barium | 0.50 |
| Cadmium | 0.01 |
| Chromium (Hexavalent) | 0.05 |
| Lead | 0.05 |
| Silver | 0.05 |

9. Other Compounds:

| Constituents | Concentration mg/1 |
|---|---|
| Nitrates | 45 |
| Chlorides | 100 |
| Sulfates | 200 |
| Phenol | 0.001 |
| Cyanide | 0.025 |
| Fluoride | 1.0 |
| Selenium | 0.01 |

(c) Future Uses: A, B1, B2, B3, C, D, E (See Section 6).

(d) **Water Quality Criteria for Future Uses:**
Same as for Present Uses.

(e) In special cases where the facts warrant, more stringent standards, or exceptions to the above standards, may be established in the individual case.

## Section 13. WATER USES AND WATER QUALITY CRITERIA.

13.01 The following criteria are established for the purpose of maintaining water quality in the Monongahela River and all its tributaries from the West Virginia-Pennsylvania State line to the confluence of the Tygart Valley and West Ford Rivers. Rivers.

(a) Present Uses: A, B1, B2 (See Section 6).

(b) **Water Quality Criteria for Present Uses:**
Based on a minimum flow of 345 cfs at Lock and Dam # 8, main stem Monongahela River. On the tributaries of the Monongahela River the following stream quality standards are to apply at all times when flows are equal to or greater than the minimum mean 7-consecutive-day drought flow with a 10-year return frequency.

1. Dissolved Oxygen: Not less than 5 mg/1 at any time.
2. pH: Values normal for the waters in the area in question, however, generally held between 6.0 and 8.5, except streams carrying significant quantities of acid mine drainage shall have a pH of not less than 5.5.
3. Temperature: Not to exceed 87°F at any time during the months of May through November and not to exceed 73°F at any time during months of December through April.
4. Threshold Odor: Threshold odor not to exceed a threshold odor number of 8 at 60°C as a daily average.
5. Toxic Substances: Not to exceed 1/10 of the 96-hour median tolerance limit.
6. Bacteria: The Coliform group is not to exceed 1,000 per 100 ml as a monthly average nor exceed this number in more than 20 percent of the samples examined during any month, nor exceed 2,400 per ml on any day.
7. Radioactivity: Gross beta activity not to exceed 1,000 picocuries per liter (pCi/1) nor shall activity from dissolved strontium-90 exceed 10 pCi/1, nor shall activity from dissolved alpha emitters exceed 3 pCi/1.
8. Heavy Metals: Not to exceed the following:

| Constituents | Concentration mg/1 |
|---|---|
| Arsenic | 0.01 |
| Barium | 0.50 |
| Cadmium | 0.01 |
| Chromium (Hexavalent) | 0.05 |
| Lead | 0.05 |
| Silver | 0.05 |

9. Other Compounds:

| Constituents | Concentration mg/1 |
|---|---|
| Nitrates | 45 |
| Chlorides | 100 |
| Sulfates | 200 |
| Phenol | 0.001 |
| Cyanide | 0.025 |
| Fluoride | 1.0 |
| Selenium | 0.01 |

(c) Future Uses: A, B1, B2, B3, C, D, E (See Section 6).

(d) **Water Quality Criteria:**
Same as Present Uses as modified below.

1. **Bacteria: The Coliform group is not to exceed 1,000 per 100 ml as a monthly average value, nor exceed this number in 20 percent of the samples examined during any month, nor exceed 2,400 per 100 ml on any day.**

**(e) In special cases where the facts warrant, more stringent standards, or exceptions to the above standards, may be established in the individual case.**

13.02 The following criteria are established for the purpose of maintianing water quality in the West Fork River and all its tributaries from its mouth to its headwaters. The following stream quality standards are to apply at all times when flows are equal to or greater than the minimum mean 7-consecutive-day drought flow with a 10-year return frequency.

(a) Present Uses: A, B1, B2, B3, C, D, E (See Section 6).

(b) **Water Quality Criteria for Present Uses:**

1. Dissolved Oxygen: Not less than 5 mg/1 at any time.
2. pH: Values normal for the waters in the area in question, however, generally held between 6.0 and 8.5, except streams carrying significant quantities of acid mine drainage shall have a pH of not less than 5.5.
3. Temperature: Not to exceed 87°F at any time during the months of May through November and not to exceed 73°F at any time during the months of December through April.
4. Threshold Odor: Threshold odor not to exceed a threshold odor number of 8 at 60°C as a daily average.
5. Toxic Substances: Not to exceed 1/10 of the 96-hour median tolerance limit.
6. Bacteria: The Coliform group is not to exceed 1,000/100 ml as a monthly average value, nor exceed this number in more than 20 percent of the samples examined during any month, nor exceed 2,400 per 100 100ml on any day.
7. Radioactivity: Gross beta activity not to exceed 1,000 picocuries per liter (pCi/1) nor shall activity from dissolved strontium-90 exceed 10 pCi/1, nor shall activity from dissolved alpha emitters exceed 3 pCi/1.
8. Heavy Metals: Not to exceed the following:

| Constituents | Concentration mg/1 |
|---|---|
| Arsenic | 0.01 |
| Barium | 0.50 |
| Cadmium | 0.01 |
| Chromium (Hexavalent) | 0.05 |
| Lead | 0.05 |
| Silver | 0.05 |

9. **Other Compounds:**

| Constituents | Concentration mg/1 |
|---|---|
| Nitrates | 45 |
| Chlorides | 100 |
| Sulfates | 200 |
| Phenol | 0.001 |
| Cyanide | 0.025 |
| Fluoride | 1.0 |
| Selenium | 0.01 |

(c) Future Uses: A, B1, B2, B3, C, D, E (See Section 6).

(d) Water Quality Criteria: Same as for Present Uses.

(e) In special cases where the facts warrant, more stringent standards, or exceptions to the above standards, may be established in the individual case.

13.03 The following criteria are established for the purpose of maintaining water quality in the Tygart Valley River and all its tributaries from its mouth to its headwaters. The following stream standards are to apply at all times when flows are equal to or greater than the minimum mean 7-consecutive-day drought flow with a 10-year return frequency.

(a) Present Uses: A, B1, B2, B3, C, D, E (See Section 6).

(b) **Water Quality Criteria for Present Uses:**

1. Dissolved Oxygen: Not less than 5 mg/1 at any time.
2. pH; Values normal for the waters in question, however, generally held between 6.0 and 8.5, except streams carrying significant quantities of acid mine drainage shall have a pH of not less than 5.5.
3. Temperature: Not to exceed 87°F at any time during the months of May through November and not to exceed 73°F at any time during months of December through April.
4. Threshold Odor: Threshold odor not to exceed a threshold odor number of 8 at 60°C as a daily average.
5. Toxic Substances: Not to exceed 1/10 of the 96-hour median tolerance limit.
6. Bacteria: The Coliform group is not to exceed 1000/100 ml as a monthly average value; nor exceed this number in more than 20 percent of the samples examined during any month; nor exceed 2,400 per 100 ml on any day.

7. Radioactivity: Gross beta activity not to exceed 1,000 picocuries per liter (pCi/1) nor shall activity from dissolved strontium-90 exceed 10 pCi/1, nor shall activity from dissolved alpha emitters exceed 3 pCi/1.

8. Heavy Metals: Not to exceed the following:

| Constituents | Concentration mg/1 |
|---|---|
| Arsenic | 0.01 |
| Barium | 0.50 |
| Cadmium | 0.01 |
| Chromium (Hexavalent) | 0.05 |
| Lead | 0.05 |
| Silver | 0.05 |

9. Other Compounds:

| Constituents | Concentration mg/1 |
|---|---|
| Nitrates | 45 |
| Chlorides | 100 |
| Sulfates | 200 |
| Phenol | 0.001 |
| Cyanide | 0.025 |
| Fluoride | 1.0 |
| Selenium | 0.01 |

(c) Future Uses: A, B1, B2, B3, C, D, E (See Section 6).

(d) Water Quality Criteria: Same as for Present Uses.

(e) In special cases where the facts warrant, more stringent standards, or exceptions to the above standards, may be established in the individual case.

13.04 The following criteria are established for the purpose of maintiaining water quality in the Cheat River and all its tributaries from the West Virginia-Pennsylvania State line to its headwaters. The following stream quality standards are to apply at all times when flows are equal to or greater than the minimum mean 7-consecutive-day drought flow with a 10-year return frequency.

(a) Present Uses: A, B1, B2, B3, C, D, E (See Section 6).

(b) Water Quality Criteria for Present Uses:

1. Dissolved Oxygen: Not less than 5 mg/1 at any time.
2. pH; Values normal for the waters in the area in question, however, generally held between 6.0 and 8.5, except streams carrying significant quantities of acid mine drainage shall have a pH of not less than 5.5.
3. Temperature: Not to exceed 87°F at any time during the months of May through November and not to exceed 73°F at any time during the months of December through April.
4. Threshold Odor: Threshold odor not to exceed a threshold odor number of 8 at 60°C as a daily average.
5. Toxic Substances: Not to exceed 1/10 of the 96-hour median tolerance limit.
6. Bacteria: The Coliform group is not to exceed 1000/100 ml as a monthly average value, nor exceed this number in more than 20 percent of the samples examined during any month, nor exceed 2,400 per 100 ml on any day.
7. Radioactivity: Gross beta activity not to exceed 1,000 picocuries per liter (pCi/1) nor shall activity from dissolved strontium-90 exceed 10 pCi/1, nor shall activity from dissolved alpha emitters exceed 3 pCi/1.
8. Heavy Metals: Not to exceed the following:

| Constituents | Concentration mg/1 |
|---|---|
| Arsenic | 0.01 |
| Barium | 0.50 |
| Cadmium | 0.01 |
| Chromium (Hexavalent) | 0.05 |
| Lead | 0.05 |
| Silver | 0.05 |

9. Other Compounds:

| Constituents | Concentration mg/1 |
|---|---|
| Nitrates | 45 |
| Chlorides | 100 |
| Sulfates | 200 |
| Phenol | 0.001 |
| Cyanide | ,0.025 |
| Fluoride | 1.0 |
| Selenium | 0.01 |

(c) Future Uses: A, B1, B2, B3, C, D, E (See Section 6).

(d) Water Quality Criteria: Same as for Present Uses.

(e) In special cases where the facts warrant, more stringent standards, or exceptions to the above standards, may be established in the individual case.

13.05 The following criteria are established for the purpose of maintaining water quality in those tributaries of the Youghiogheny River in West Virginia which are interstate with Maryland. The following stream quality standards are to apply at all times when flows are equal to or greater than the minimum mean 7-consecutive-day drought flow with a 10-year return frequency.

(a) Present Uses: B1, E (See Section 6).

(b) Water Quality Criteria for Present Uses:

1. Dissolved Oxygen: Not less than 5 mg/1

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at any time.

2. pH: Values normal for the waters in the area in question, however, generally held between 6.0 and 8.5, except streams carrying significant quantities of acid mine drainage shall have a pH of not less than 5.5.
3. Temperature: Not to exceed 87°F at any time during the months of May through November and not to exceed 73°F at any time during the months of December through April.
4. Threshold Odor: Threshold odor not to exceed a threshold odor number of 8 at 60°C as a daily average.
5. Toxic Substances: Not to exceed 1/10 of the 96-hour median tolerance limit.
6. Bacteria: The Coliform group is not to exceed 5,000 per 100 ml as a monthly average nor exceed this number in more than 20 percent of the samples examined during the month, nor exceed 20,000 per 100 ml in more than 5 percent of the samples.
7. Radioactivity: Gross beta activity not to exceed 1,000 picocuries per liter (pCi/1) nor shall activity from dissolved strontium-90 exceed 10 pCi/1, nor shall activity from dissolved alpha emitters exceed 3 pCi/1.
8. Heavy Metals: Not to exceed the following:

| Constituents | Concentration mg/1 |
|---|---|
| Arsenic | 0.01 |
| Barium | 0.50 |
| Cadmium | 0.01 |
| Chromium (Hexavalent) | 0.05 |
| Lead | 0.05 |
| Silver | 0.05 |

9. Other Compounds:

| Constituents | Concentration mg/1 |
|---|---|
| Nitrates | 45 |
| Chlorides | 100 |
| Sulfates | 200 |
| Phenol | 0.001 |
| Cyanide | 0.025 |
| Fluoride | 1.0 |
| Selenium | 0.01 |

(c) Future Uses: B1, E (See Section 6).

(d) Water Quality Criteria: Same as for Present Uses.

(e) In special cases where the facts warrant, more stringent standards, or exceptions to the above standards, may be established in the individual case.

## Section 14. COIN OPERATED AND OTHER COMMERCIAL LAUNDRIES

14.01 The increasing appearance of coin operated and other commercial laundries, particularly in unsewered areas, has led to a variety of waste water treatment problems.

In order to establish minimum requirements governing construction of such waste water handling facilities and in accordance with Chapter 20, Article 5A, Code of West Virginia, the following Administrative Regulations are established.

14.02 Coin operated laundries and other commercial laundries located within the corporate limits of a West Virginia Municipality, Town, or within the boundaries of a Public Service District, or Sanitary District, or a privately owned installation having an approved sewage treatment facility shall divert waste water to these systems for treatment.

(a) Laundry discharging directly to sewer. A laundry without pretreatment of the waste water connected to a sewer requires adherence to local plumbing codes and to any special regulations regarding acceptance of waste at the sewage treatment plant.

(b) Laundry with pre-treatment and discharge directly to sewer. The laundry shall provide equipment for removal of lint from the water.

14.03 Coin operated and other commercial laundries located outside of the corporate limits of a West Virginia minicipality or Town, or the boundaries of a Public Service District or Sanitary District not served by an approved sewage treatment facility shall either divert waste water to an approved sewage treatment facility or shall be governed by the following:

1. Construction and operation of such treatment facilities shall meet the following minimum requirements in addition to those described elsewhere by law or Administrative Regulation series one and two.

   (a) Substantial removal of all settleable solids.

   (b) Ninety percent removal of 5-day bio-chemical oxygen demand.

   (c) Detergent level ABS or LAS shall be reduced to such level that the discharge shall contain no more than 0.5 mg/1 of ABS or LAS.

   (d) Chlorination of final effluent is required at the initial installation. A chlorination contact chamber shall provide a contact period of at least 15 minutes with a residual of 0.5 mg/1 of chlorine at maximum flow.

(e) Laundry discharging water to a receiving stream used primarily for recreational pursuit and supporting sport fisheries shall in addition to items (a) through (e) provide tertiary treatment for additional BOD removal to 10 mg/1.

2. **Laundry with no waste water discharge.** A laundry may be located where no discharge of the waste water can be made to a sanitary sewer or a receiving stream. In these cases, holding tanks shall be provided for wastes and the waste must be transported to an approved waste water treatment plant for treatment.

14.04 The following systems are non-allowable and will not be permitted:

(a) Septic tanks with or without leach fields.
(b) Cess pools.
(c) Direct or indirect discharge of untreated or inadequately treated laundry waste water to a West Virginia water.

## Section 15. COIN OPERATED AND OTHER COMMERCIAL CAR WASHING ESTABLISHMENTS

15.01 The increasing appearance of coin operated and other commercial car washing establishments, particularly in unsewered areas, has led to a variety of waste water treatment problems.

In order to establish minimum requirements governing construction of such waste water handling facilities and in accordance with Chapter 20, Article 5A, Code of West Virginia, the following Administrative Regulations are established.

15.02 Coin operated and other commercial car washing establishements located within the corporate limits of a West Virginia Municipality, Town, or within the boundaries of a Public Service District, Sanitary District or privately owned installation having an approved sewage treatment facility shall divert waste water to these systems for treatment:

(a) **Carwash with discharge directly to sewer.** A carwash discharging to the sewer without pretreatment of the waste water requires adherence to local plumbing codes and to any special local regulations regarding acceptance of waste at the sewage treatment plant.

(b) **Carwash with pre-treatment system discharging directly to sewer.** A device to prevent large items from entering the sewer lines shall be required. A settling tank shall be required to remove settleable solids from the waste water.

(c) Coin operated and other commercial car washing establishments located within the corporate limits of a West Virginia Municipality, Town, or within the boundaries of a Public Service District or Sanitary District having an approved sewage treatment facility and not wishing nor required to utilize this facility must proceed under Section 15.03 of this regulation.

15.03 Any coin operated or other commercial establishment located outside the corporate limits of a West Virginia Municipality or Town, or outside the boundaries of a Public Service District or Sanitary District, or within the corporate limits of a West Virginia Municipality or Town, or the boundaries of a Public Service District or Sanitary District not served by an approved sewage treatment facility shall either divert waste water to an approved sewage treatment facility or shall be governed by the following:

1. Construction and operation of such treatment facilities shall meet the following minimum requirements in addition to those prescribed elsewhere by law or Administrative Regulations series one and two.

(a) Substantial removal of all settleable solids.
(b) Ninety percent removal of 5-day bio-chemical oxygen demand.
(c) Detergent level ABS or LAS shall be reduced to such level that the discharge shall contain no more than 0.1 mg/1 of ABS or LAS.
(d) Chlorination of final effluent is required at the initial installation, if domestic sewage is to be treated within the installation. A chlorination contact chamber shall provide a contact period of at least 15 minutes with a residual of 0.5 mg/1 of chlorine at maximum flow.
(e) A grease trap shall be installed and properly maintained within the system to prevent oils and grease entrapment with waste water effluent.
(f) A grit removal chamber shall be installed in such a manner to be readily cleaned.
(g) A car wash discharging waste water to a receiving stream used primarily for recreation pursuits and supporting sport fisheries shall in addition to items (a) through (f) provide tertiary treatment equipment in addition to secondary treatment. Tertiary treatment provides for additional BOD removal to 10 mg/1 in the effluent.

2. **Carwash with no waste water discharge.** Carwashes may be located where no discharge of the waste water can be made to a sanitary sewer or a receiving stream. In these cases, holding tanks shall be provided for wastes and the wastes must be transported to an approved waste water treatment plant for treament.

3. **Carwash re-using waste water.** Carwashes employing a re-use system shall provide removal facilities for settleable materials. These materials must be transported to an approved disposal site.

15.04 The following systems are non-allowable and will not be permitted.

- (a) Septic tanks with or without leach fields.
- (b) Cess pools.
- (c) Direct or indirect discharge of untreated or improperly treated waste water from coin operated and other commercial car washing establishments to West Virginia waters.

## Section 16. TROUT STREAMS

16.01 Trout streams, headwaters of streams, trout lakes and reservoirs and the hypolimnion of lakes and reservoirs containing salmonids should not be warmed. No heated effluents should be discharged in the vicinity of spawing areas. These streams include but are not limited to the following streams or portions thereof: Dry Fork, a tributary of the Tug Fork River; East River and Rich Creek, tributaries of the New River; Potts Creek, a tributary of the James River; Opequon Creek, a tributary of the Potomac River; Mill Creek, a tributary of Opequon Creek; the South Branch of the Potomac River from Petersburg to its headwater; and Long Marsh Run, a tributary of the Shenandoah River.

(a) Water Quality for Trout Streams:

1. During any month of the year, heat should not be added to a stream in excess of the amount that will raise the temperature of the water more than 5°F. (based on the minimum expected flow for that month). In lakes and reservoirs, the temperature of the epilimnion should not be raised more than 3 °F by the addition of heat of artificial origin.
2. The normal daily and seasonable temperature fluctuations that existed before the addition of heat due to other than natural causes should be maintained.
3. The maximum temperatures for cold waters are expressed in the following table:

| | Daily Mean °F | Hourly Max. °F |
|---|---|---|
| October—April | 50 | 55 |
| September & May transition period | 58 | 62 |
| June—August | 66 | 70 |

4. Dissolved Oxygen: Not less than 6.0 mg/1 at any time.
5. pH: Not less than 6.0 nor more than 8.5.

6. Threshold Odor: Threshold odor not to exceed a threshold odor number of 8 at 60°C as a daily average.
7. Toxic Substances: Not to exceed 1/10 of the 96-hour median tolerance limit.
8. Bacteria: The Coliform group is not to exceed 1,000 per 100 ml as a monthly average value, nor exceed this number in 20 percent of the samples examined during any month, nor exceed 2,400 per 100 ml on any day.
9. Radioactivity: Gross beta activity not to exceed 1,000 picocuries per liter (pCi/1) nor shall activity from dissolved strontium-90 exceed 10 pCi/1, nor shall activity from dissolved alpha emitters exceed 3 pCi/1.
10. Heavy Metals: Not to exceed the following:

| Constituents | Concentration mg/1 |
|---|---|
| Arsenic | 0.01 |
| Barium | 0.50 |
| Cadmium | 0.01 |
| Chromium (Hexavalent) | 0.05 |
| Lead | 0.05 |
| Silver | 0.05 |

11. Other Compounds: Not to exceed the following:

| Constituents | Concentration mg/1 |
|---|---|
| Nitrates | 45 |
| Chlorides | 100 |
| Sulfates | 200 |
| Phenol | 0.001 |
| Cyanide | 0.025 |
| Fluoride | 1.0 |
| Selenium | 0.01 |

## Section 17. WATER PURIFICATION WASTE WATER CONTROL MEASURE

17.01 Waste Disposal — Provision must be made for proper disposal of wastes from water treatment plants. Such wastes include but are not limited to those eminating from sanitary facilities, laboratories, clarification facilities, softening facilities, and filter backwash. Discharges shall be governed by Chapter 20, Article 5A, Code of West Virginia and the following regulations:

(a) The following means of waste and sludge disposal may be considered:

1. Lagoon design must provide the following:
   - a. Location free from flooding.
   - b. Dikes, deflecting gutters or other means of diverting surface water when necessary.

- c. A minimum depth of 4 to 5 feet.
- d Multiple cell.
- e. Adjustable decanting devices.
- f. Convenient cleaning.

2. Sludge beds for lime softening sludge or other sludges must provide the following:

- a. Location free from flooding.
- b. Multiple beds, each designed for at least one year's storage.
- c. Size of sludge beds will be governed by the concentration of solids to be disposed of with an ultimate depth of 12 inches dry basis.
- d. Distribution channels may be required for spreading sludge over entire area.
- e. Easy access roads and loading ramps with proper under drains must be provided.
- f. Tank Truck — Trucking wet sludge to agricultural lands or disposal areas requires proper handling, vehicles and equipment to permit hauling and spreading without creation of nuisances. It is necessary to provide sludge holding facilities for use during times that trucks cannot operate.

3. Community Wastewater Treatment Facility—Discharges to sewer systems and their treatment facilities depend on type of treatment, rate of discharge, plant design capacity, character of waste, and local conditions.

4. Other Methods — These include holding tanks, vacuum filters, centrifuging and recalcining. Detailed studies must be made to justify their use.

5. Sanitary Waste — The sanitary waste from water treatment plants, pumping stations, etc., must receive treatment. Waste from these facilities must be discharged either directly to a sanitary sewer system with approved treatment or to an individual waste disposal facility providing suitable treatment. The effluent must be acceptable for discharge to the surface of ground waters.

COMMONWEALTH OF PENNSYLVANIA

DEPARTMENT OF ENVIRONMENTAL RESOURCES
P. O. Box 2351
Harrisburg 17105

November 3, 1971

Mr. Murray Stein
Chief, Enforcement Officer - Water
EPA - Environmental Protection Agency
1921 Jefferson David Highway
Crystal Mall Building 2.R.
Arlington, Virginia

Dear Mr. Stein:

Mrs. Georgine Adams from this office spoke with you by telephone on September 15, 1971 regarding the incorrect status reported on one sewerage case in Publication No. 29 dated August, 1971, Water Quality Management in the Monongahela River Basin, a report by the Pennsylvania Department of Environmental Resources, Bureau of Sanitary Engineering.

It is requested that the transcript from the conference be corrected to show the enforcement action status for Elizabeth Municipal Authority, Allegheny County to be "upgrade order issued January 16, 1968 - satisfactory progress".

Sincerely yours,

Daniel B. Drawbaugh, Director
Division of Water Supply and Sewerage

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**ENVIRONMENTAL PROTECTION AGENCY**
Office of Enforcement and General Counsel
5555 Ridge Avenue, Cincinnati, Ohio 45213

August 31, 1971

TO : Murray Stein, Chief Enforcement Officer
Federal Water Quality Enforcement Office

FROM : Lowell A. Van Den Berg, Deputy Director LAVDB
Cincinnati Field Investigations Center

SUBJECT: Letter from Mr. James S. Bennett

Enclosed is a copy of a letter from Mr. James S. Bennett, State Conservationist, U. S. Department of Agriculture Soil Conservation Service, Morgantown, West Virginia. Mr. Bennett has requested that this letter be made a part of the official record of the Monongahela River Enforcement Conference held August 24 and 25, 1971 at Pittsburgh, Pennsylvania.

We will also honor Mr. Bennett's request for any additional information on the mine drainage problem in the Monongahela as that information becomes available.

If the decision is made to include this in the official record, please provide copies to the recorder who was present at the conference.

cc: Mr. James S. Bennett

LAVanDenBerg:kls

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
Post Office Box 865, Morgantown, West Virginia 26505

August 27, 1971

Mr. A. D. Sidio
Division of Field Investigations
Environmental Protection Agency
5555 Ridge Avenue
Cincinnati, Ohio 45213

Dear Mr. Sidio:

We appreciated the opportunity for Norris R. Caryl, Assistant State Conservationist for Watersheds, to attend the Enforcement Conference on the Monongahela River and its tributaries, held August 24 and 25, 1971, at Pittsburgh, Pennsylvania. The report and recommendations of the Technical Committee of the Monongahela River Enforcement Conference is a first and very necessary step in reducing acid mine drainage in the Basin. There can be little doubt that a large majority of the people want to do something about the problem of acid mine drainage.

I hope it was possible for the Environmental Protection Agency and conferees to decide on a concrete plan of action. Should local leadership and assistance be needed for implementation, I am sure it can be secured through the three local Soil Conservation Districts, nine active watershed protection and flood prevention projects, and the Wes-Mon-Ty Resource Conservation and Development Project area. From our long experience in working with these groups on these programs, we have found them to be most effective and cooperative.

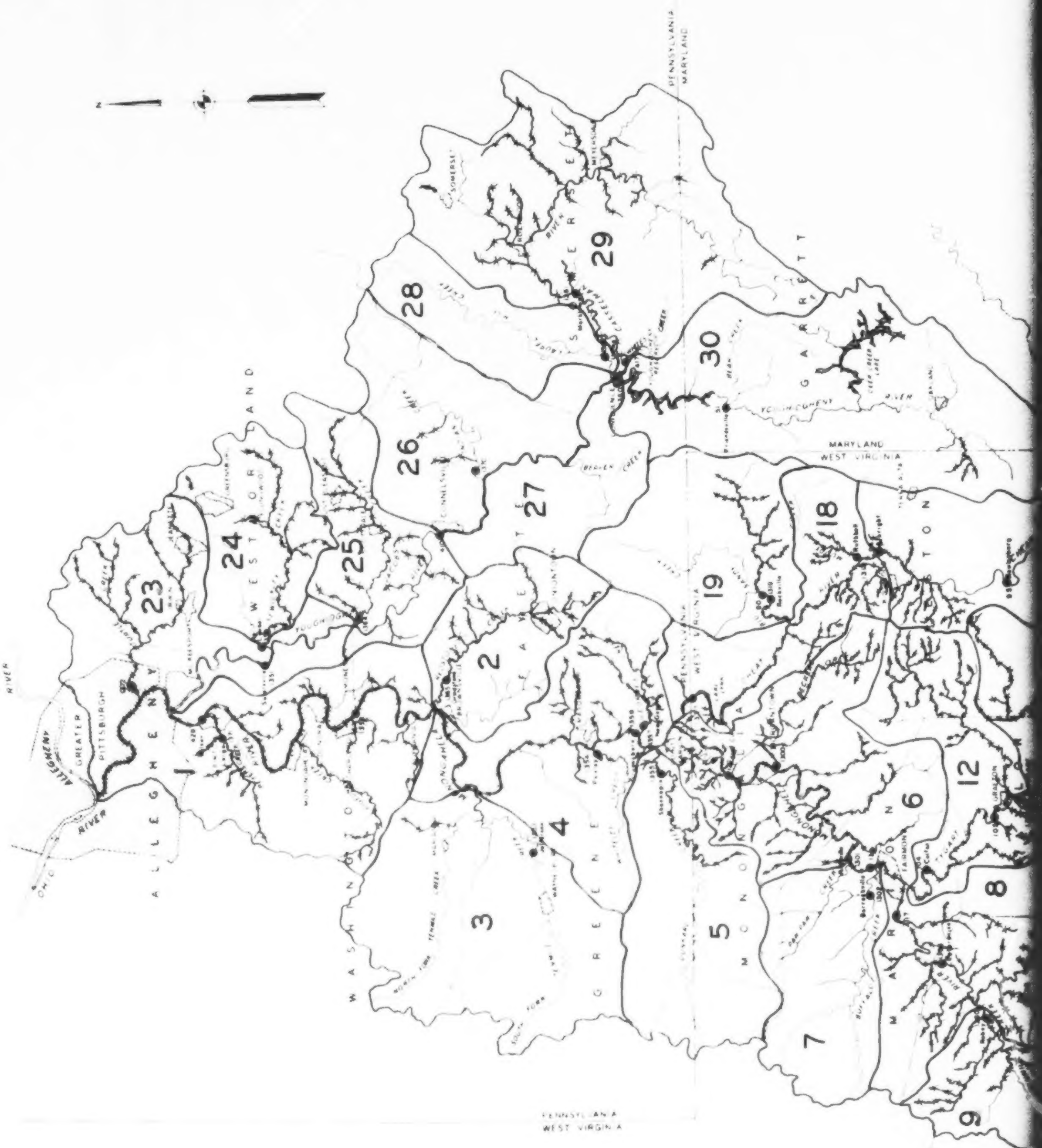
We would appreciate it if this letter could be made part of the official record of the Enforcement Conference held at Pittsburgh on August 24 and 25, 1971.

If possible, we would like to be put on the mailing lists to receive information and material in regard to this matter. Please advise if we can be of any assistance or provide information.

Sincerely yours,

James S. Bennett
State Conservationist

☆U. S. GOVERNMENT PRINTING OFFICE: 1972—456-678/658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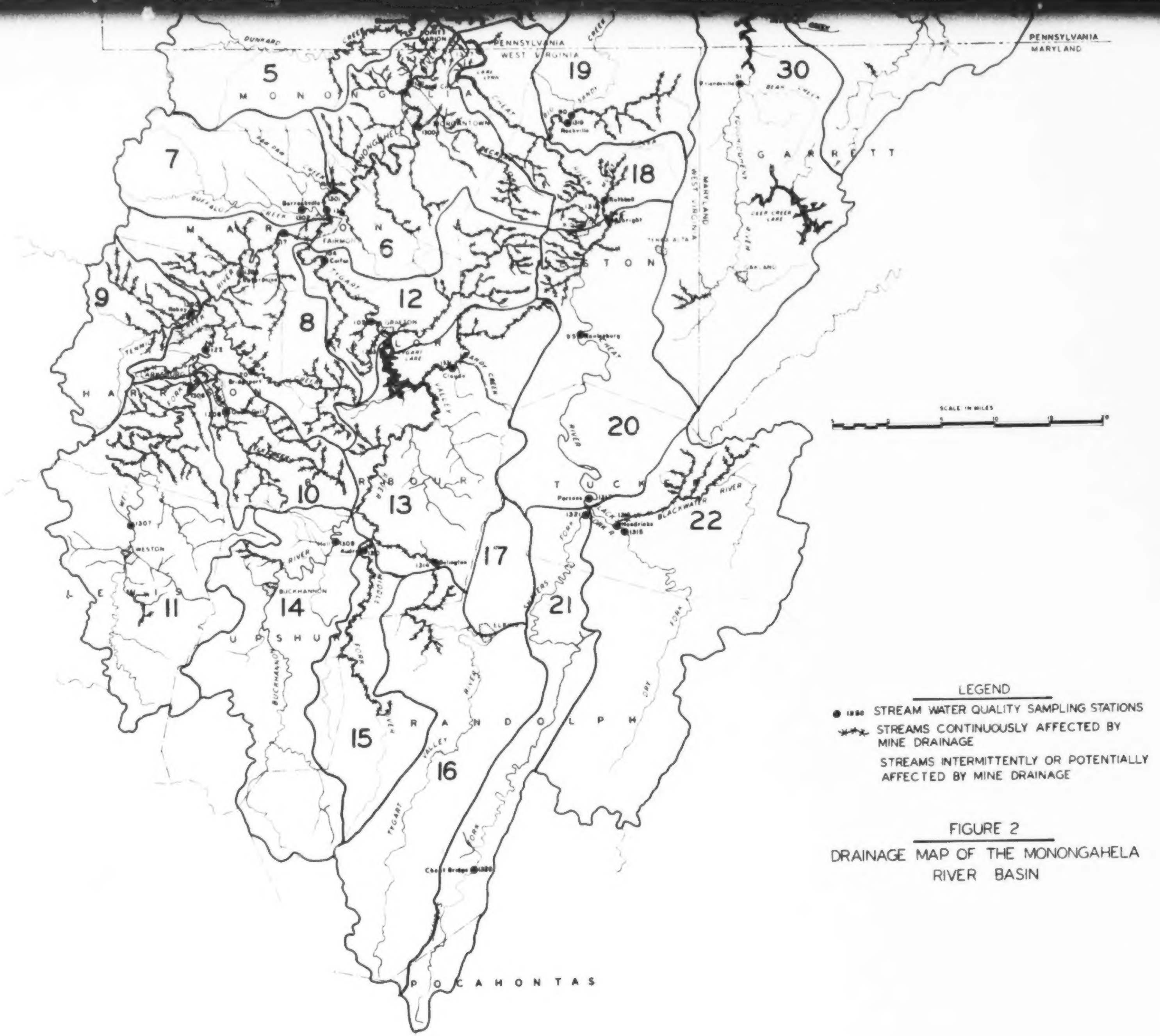

FIGURE 2

DRAINAGE MAP OF THE MONONGAHELA RIVER BASIN

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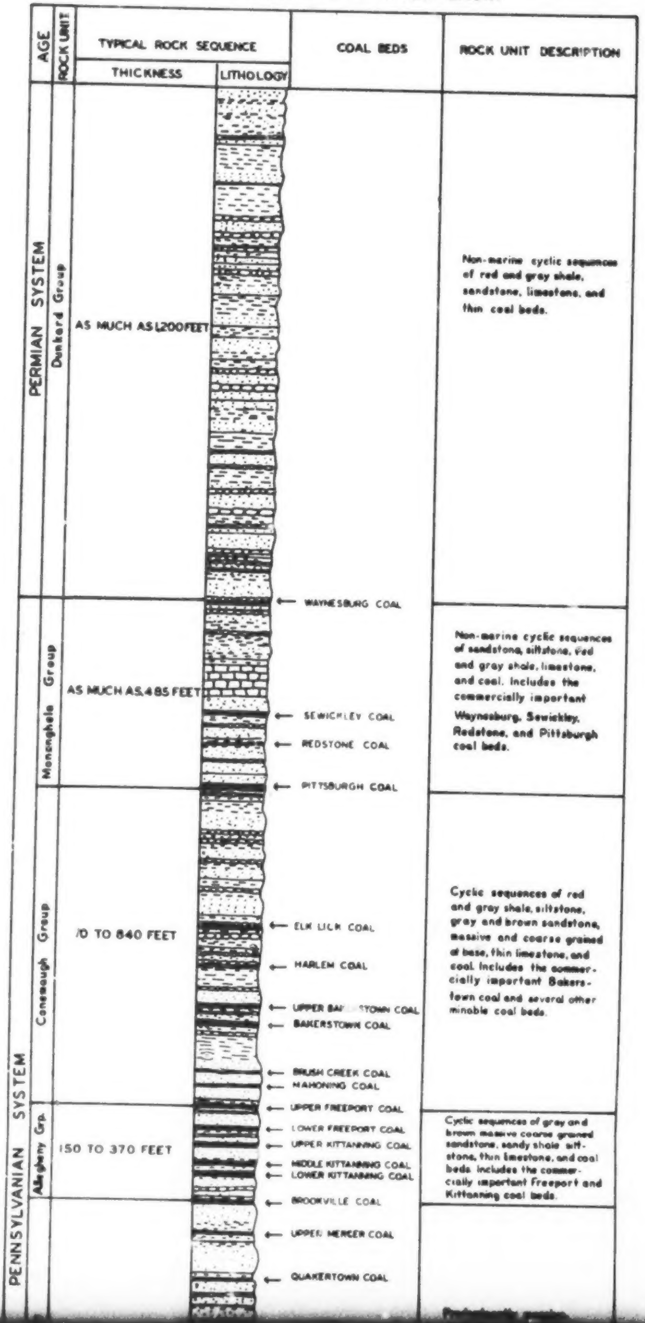
FIGURE 3

GENERALIZED STRATIGRAPHIC SECTION OF THE SURFACE ROCKS OF THE MONONGAHELA RIVER BASIN

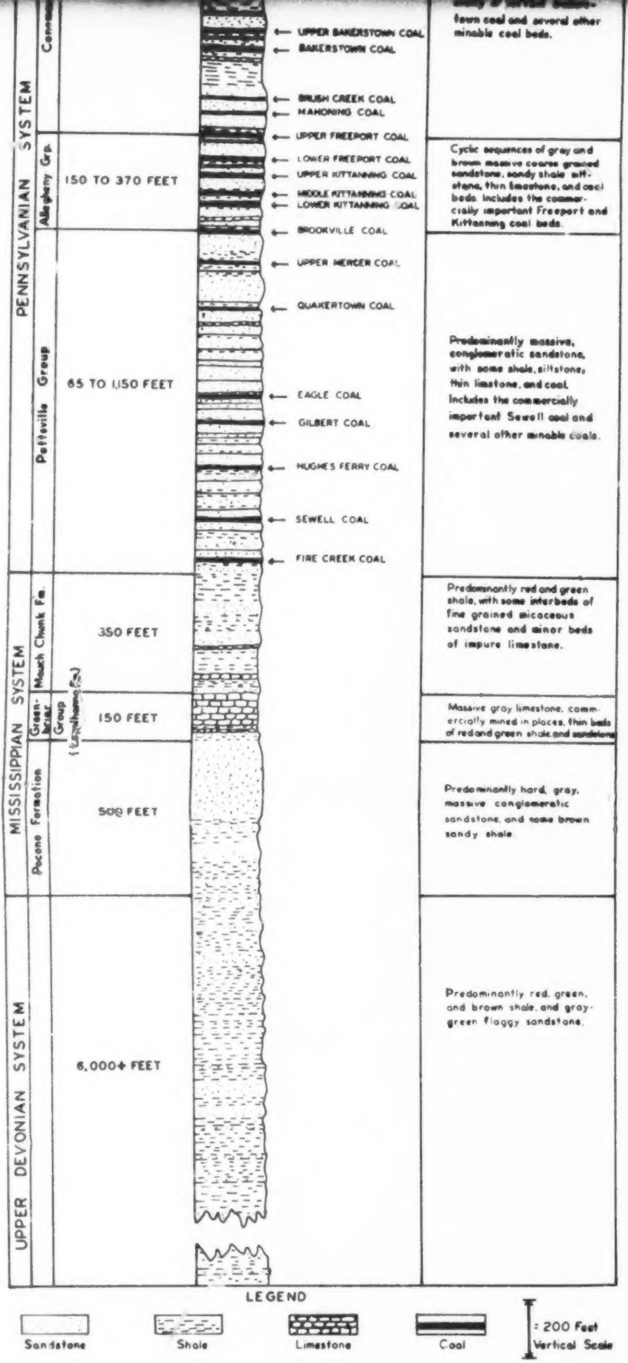


Non-marine cyclic sequences of red and gray shale, sandstone, limestone, and thin coal beds.

Non-marine cyclic sequences of sandstone, siltstone, red and gray shale, limestone, and coal. Includes the commercially important Waynesburg, Sewickley, Redstone, and Pittsburgh coal beds.

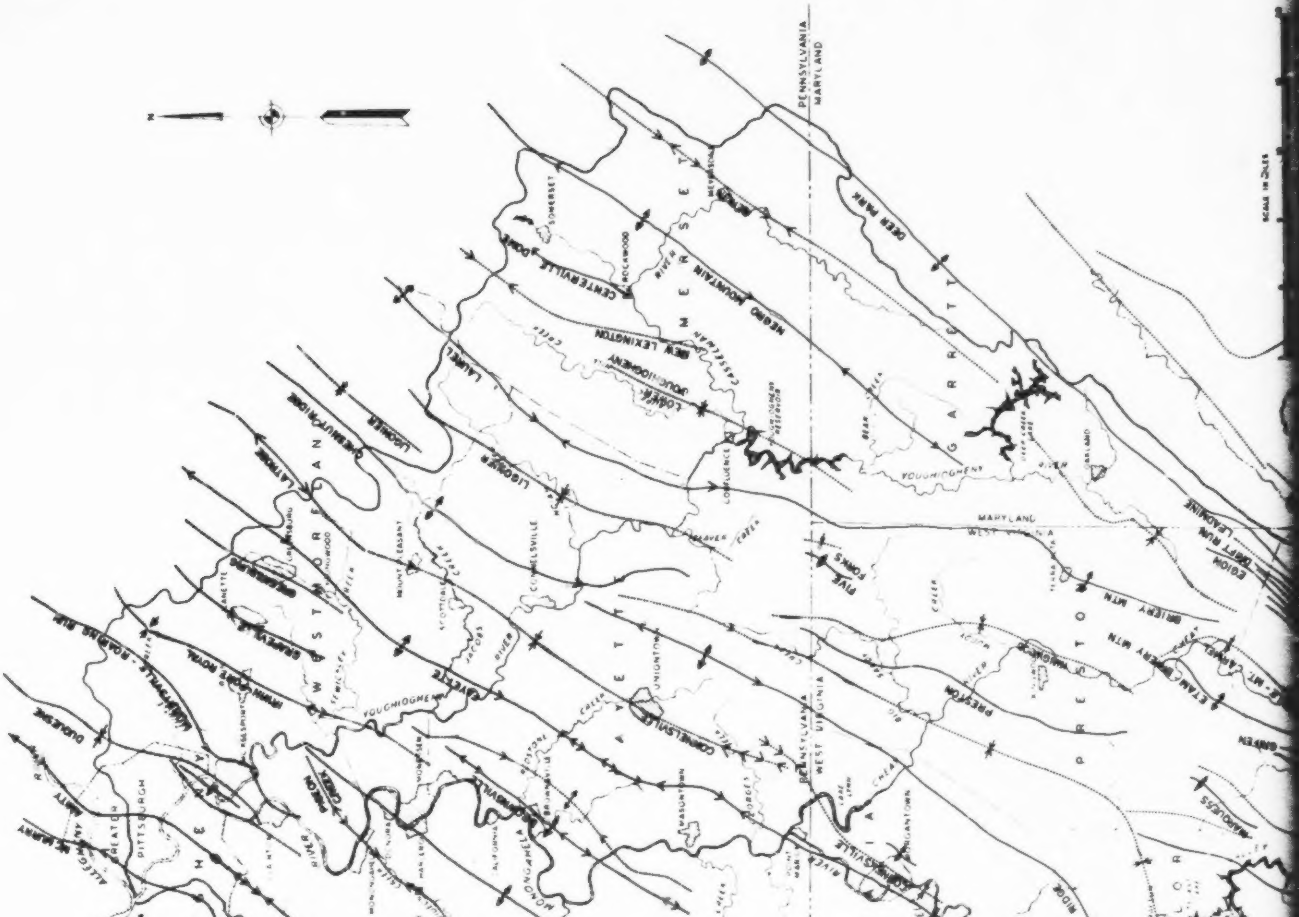
Cyclic sequences of red and gray shale, siltstone, gray and brown sandstone, massive and coarse grained at base, thin limestone, and coal. Includes the commercially important Bakerstown coal and several other minable coal beds.

Cyclic sequences of gray and brown massive coarse grained sandstone, sandy shale siltstone, thin limestone, and coal beds. Includes the commercially important Freeport and Kittanning coal beds.


PENNSYLVANIAN SYSTEM
Conem
Allegheny Grp.
150 TO 370 FEET
Pottsville Group
65 TO 1,150 FEET
UPPER BAKERSTOWN COAL
BAKERSTOWN COAL
BRUSH CREEK COAL
MAHONING COAL
UPPER FREEPORT COAL
LOWER FREEPORT COAL
UPPER KITTANNING COAL
MIDDLE KITTANNING COAL
LOWER KITTANNING COAL
BROOKVILLE COAL
UPPER MERCER COAL
QUAKERTOWN COAL
EAGLE COAL
GILBERT COAL
HUGHES FERRY COAL
SEWELL COAL
FIRE CREEK COAL
town coal and several other minable coal beds.
Cyclic sequences of gray and brown massive coarse grained sandstone, sandy shale, siltstone, thin limestone, and coal beds. Includes the commercially important Freeport and Kittanning coal beds.
Predominantly massive, conglomeratic sandstone, with some shale, siltstone, thin limestone, and coal. Includes the commercially important Sewell coal and several other minable coals.
MISSISSIPPIAN SYSTEM
Mauch Chunk Fm.
350 FEET
Predominantly red and green shale, with some interbeds of fine grained micaceous sandstone and minor beds of impure limestone.
Greenbrier Group
(Loyalhanna Fm.)
150 FEET
Massive gray limestone, commercially mined in places, thin beds of red and green shale and sandstone
Pocono Formation
500 FEET
Predominantly hard, gray, massive conglomeratic sandstone, and some brown sandy shale
UPPER DEVONIAN SYSTEM
6,000+ FEET
Predominantly red, green, and brown shale, and gray-green floggy sandstone.
LEGEND
Sandstone
Shale
Limestone
Coal
= 200 Feet Vertical Scale

709<

B


PENNSYLVANIA
MARYLAND
MARYLAND
WEST VIRGINIA
PENNSYLVANIA
WEST VIRGINIA
PENNSYLVANIA
WEST VIRGINIA
PITTSBURGH
SOMERSET
UNIONTOWN
MORGANTOWN
CONNELLSVILLE
CONFLUENCE
ROCKWOOD
MOUNT PLEASANT
GREENSBURG
WAYNESBURG
WASHINGTON
AMITY
DUQUESNE
NINEVEH
CENTERVILLE
NEGRO MOUNTAIN
DEER PARK
NEW LEXINGTON
LIGONIER
LATROBE
CHESTNUT RIDGE
FIVE FORKS
PRESTON
BRIERY MTN
LEADMINE
DEEP RUN
EGLON
MOORESVILLE
LAMBERT
HUNTLEY
BELLE VERNON
OHIO
RIVER
YOUGHIOGHENY
MONONGAHELA
GARRETT
W E S T M O R E L A N D
F A Y E T T E
G R E E N E
M O N O N G A L I A
A L L E G H E N Y
W A S H I N G T O N
P R E S T O N
T A Y L O R
M A R I O N
S O M E R S E T
H A R R I S O N
N

A

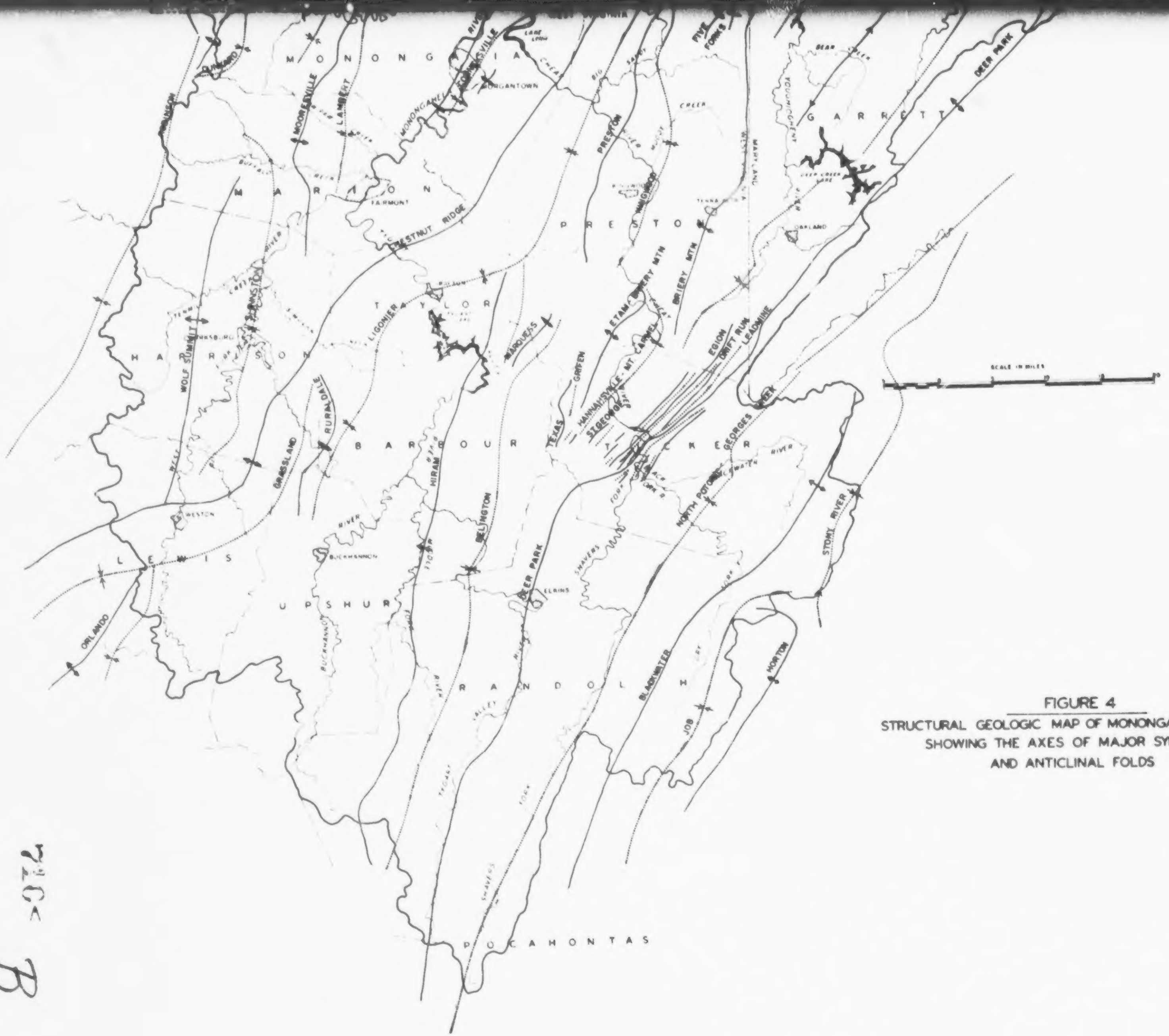


FIGURE 4

STRUCTURAL GEOLOGIC MAP OF MONONGAHELA BASIN SHOWING THE AXES OF MAJOR SYNCLINAL AND ANTICLINAL FOLDS

720<

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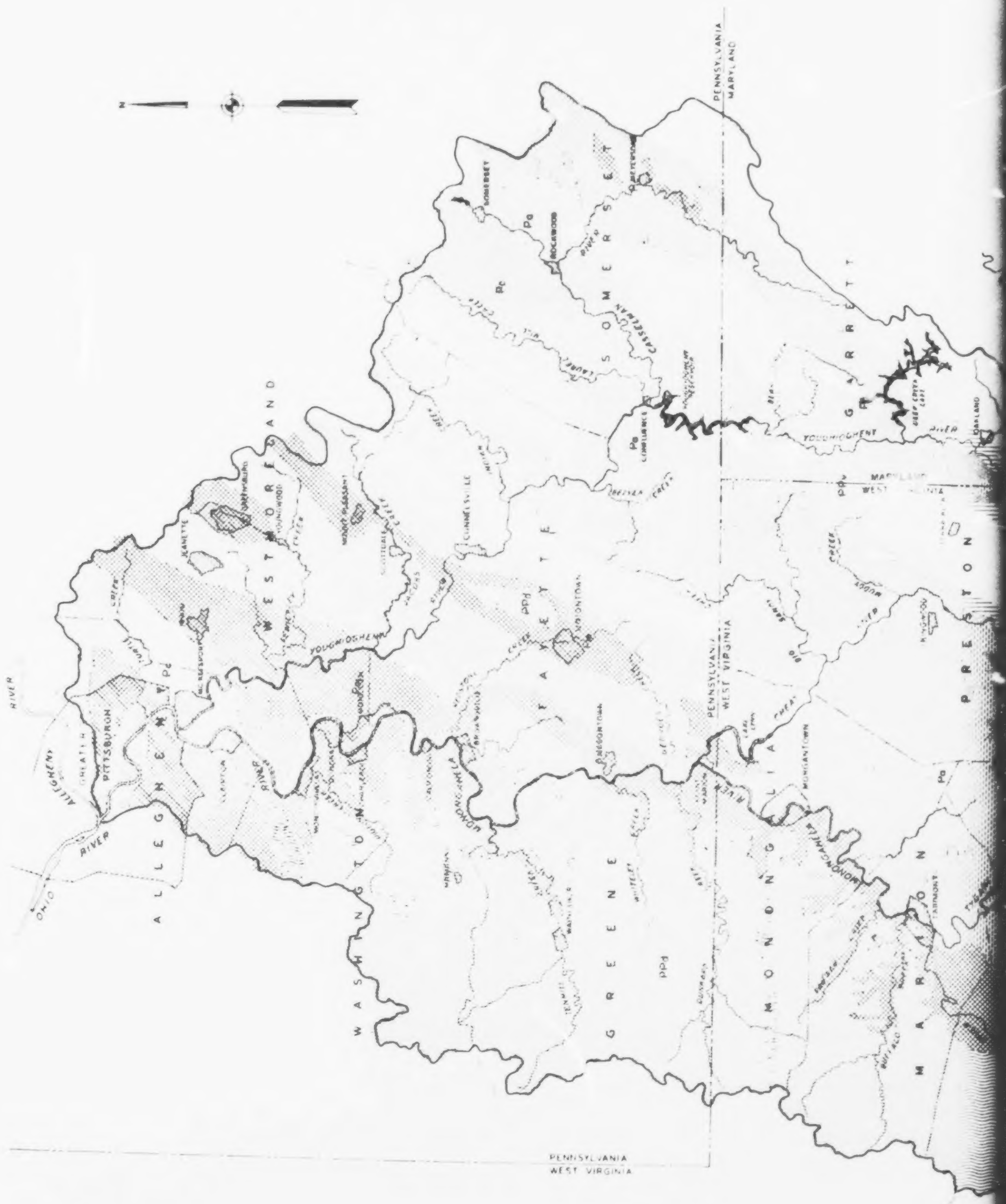
N
PENNSYLVANIA
MARYLAND
MARYLAND
WEST VIRGINIA
PENNSYLVANIA
WEST VIRGINIA
PENNSYLVANIA
WEST VIRGINIA
SOMERSET
GARRETT
WESTMORELAND
FAYETTE
PRESTON
ALLEGHENY
WASHINGTON
GREENE
MONONGALIA
MARION
GREATER PITTSBURGH
ALLEGHENY RIVER
OHIO RIVER
MONONGAHELA RIVER
YOUGHIOGHENY RIVER
CASSELMAN RIVER
CHEAT RIVER
CONNELLSVILLE
UNIONTOWN
MORGANTOWN
ROCKWOOD
CONFLUENCE
OAKLAND
DEEP CREEK LAKE
KINGWOOD
FAIRMONT
Pa
Pc
Pd
PPd

A

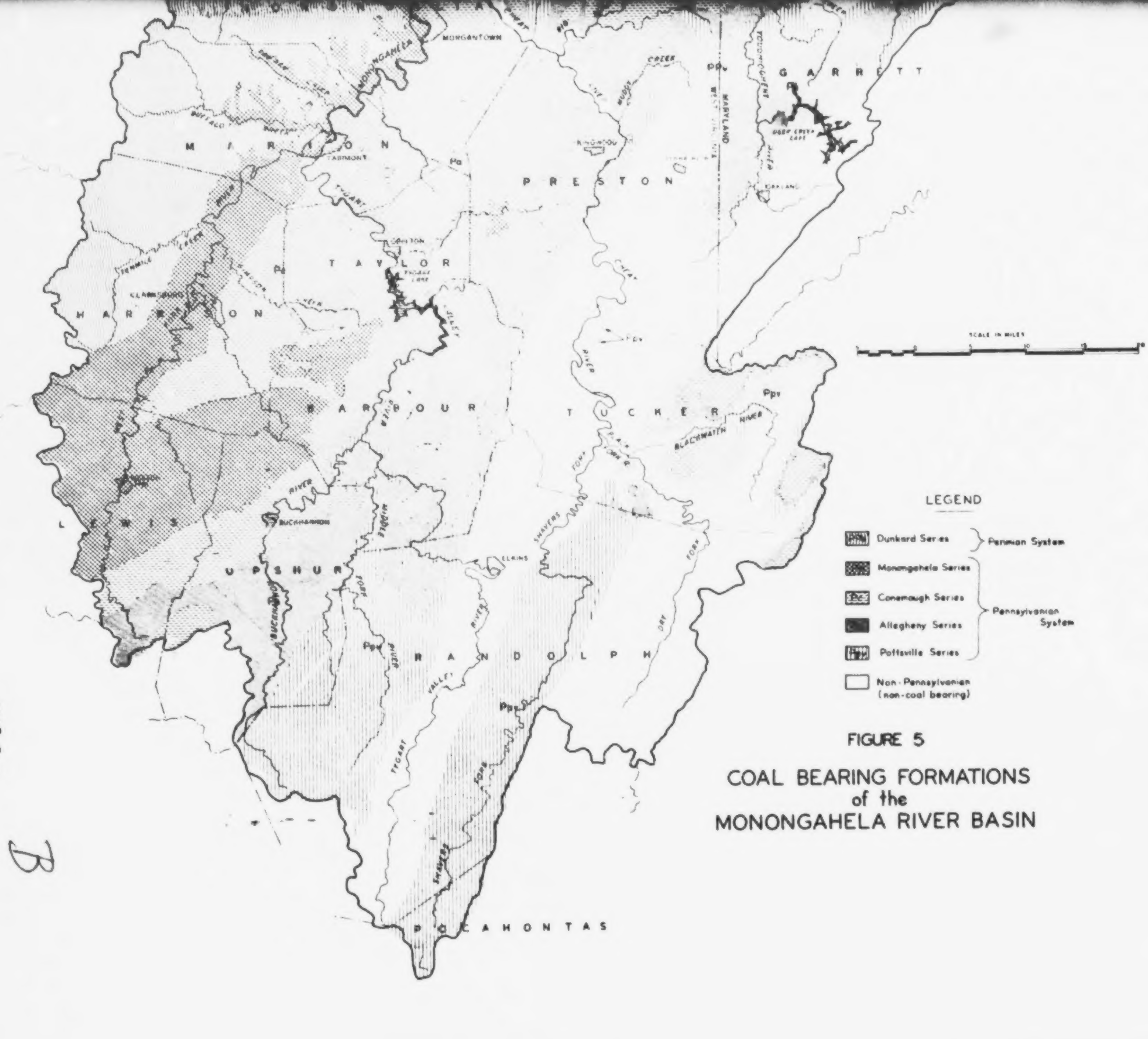

FIGURE 5

COAL BEARING FORMATIONS
of the
MONONGAHELA RIVER BASIN

711<

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